NCISM 2023

2nd Edition

A Text Book of

Dravyaguṇa Vijñāna

National Commission for Indian System of Medicine (NCISM)

Dr. Prakash L. Hegde, MD (Ayu.), Ph.D. (Ayu.)
Dr. Harini A., M.D. (Ayu.)

The
Mohandas indological Series
35

Vipul

A Text Book of
Dravyaguna Vijnana

(According to the New Syllabus of National Commission for Indian System of Medicine (NCISM)

Volume I

By
Dr. Prakash L. Hegde, MD (Ayu.), Ph.D. (Ayu.)
Dr. Harini A., M.D. (Ayu.)

Chaukhambha Publications
New Delhi

Content

1. Introduction to *Dravyaguna Shastra* **01**

- *Dravyaguna Shastrasya Lakshanam.*
- *Saptapadartha - Dravya, Rasa, Guna, Virya, Vipaka, Prabhava, Karmani Adinam Samanya Parichaya.*
- *Importance and relevance of Dravyaguna Shastra*

2. Dravya Vijnana **06**

- *Dravya Lakshna*
- *Panchabhoutikatwa of Dravya*
- *Dravya Aushadhatva*
- Classification of *Dravya* based on *Utpatti,*
- Classification of *Dravya* based on *Yoni,*
- Classification of *Dravya* based on *Prayoga,*
- Classification of *Dravya* based on *Prabhava,*
- Classification of *Dravya* based on *Doshaghna,*
- Classification of *Dravya* based on *Rasabheda*
- Classification of *Dravya* based on *Karmabheda*
- *Gana* as per Sushruta Samhita and Ashtanga Hridaya

3. Guna Vijnana **74**

- *Guna Lakshana* (Characteristic features of *Guna*)
- *Guna Sankhya* (Number of Gunas)
- *Guna Vibhajana* (Classification of *Guna*)
- *Gurvadi Guna*, research updates and clinical application
- *Paradi Guna*, research updates and clinical application
- Research Updates

4. Rasa Vijnana **103**

- *Rasa Paribhasha – Rasa Shabdasya Nanartha* (Rasa meaning in different context)
- *Rasa Lakshana* (Characteristics)
- *Rasa Sankhya* (Number of Taste)

- *Shadrasa* in relative correlation with taste of chemical constituents
- *Rasanam Panchabhautikatwam* (Predominance of Mahabhuta), *Rasa Nivratti Vishesha Hetu* (Formation of six tastes) & *Shannanam Rasasya Panchabhautika Sanghatanam Vaishishtyam*8. *Ṣ̣aṇṇānām Rasasya Pañcabhautika Sanghaṭanam Vaiśiṣṭyam*
- *Shat Rasanam Lakshanani* (Characteristics of six tastes)
- *Shatrasanam Gunakarmani* (Properties and actions of six tastes)
- *Rasatisevanajanya Vikara* (Diseases Due to Excessive Intake of Different *Rasa* Tastes)16. *Rasātisevanajanya Vikāra* (Diseases Due to Excessive Intake of Different *Rasa* Tastes)
- *Rasa Gunanam Uttama, Madhyama, Adhamatwena Vyavastha* (Grading of *Rasa* (Tastes) with Special Reference to Their Qualities)
- *Taratamata of Rasa* (Relative Superiority of Taste Based on Quality)
- *Raseshu Doshadushyanam Shamanatwa* (Effect of *Rasa* on *Dosha*–Alleviation & Aggravation)
- *Rasa Prayoga* as *Aushadha*
- *Rasa Prayoga* as *Ahara*
- Clinical application and Research updates of *Shadrasa*
- *Rasa* and *Anurasasya Bheda*

5. *Vipaka Vijnana* **134**

- *Vipaka Lakshana* (Characteristics of Vipaka)
- *Trividha Vipaka Vada* (Three types of *Vipaka*)
  III. *Trividha Vipāka Vāda*
- *Dwividha Vipaka Vada* (Two types of *Vipaka*)
  IV. *Dwividha Vipāka Vāda*
- *Vipaka Guna Karma* (Properties and actions of Vipaka)*Vipāka Guṇa Karma*
- *Vipaka Taratamya* (Grading of *Vipaka*)
- *Vipaka Upalabdhi Hetu Vipāka Upalabdhi Hetu* (Assessment of *Vipaka*) (Assessment of *Vipaka*)
- *Rasa Vipaka yorbheda Rasa Vipāka yorbheda* (Differences between *Rasa & Vipaka*) *Vipāka Tāratamya*

- Clinical Application and Research updates

6. *Virya Vijnana* 151
   - *Virya Lakshana (Characteristics of Virya)Vīrya Laxaṇa*
   - Reasons in support of considering *Gunas* as the *Virya.*
   - *Virya* Vs Active constituents
   - *Guna Virya Vada* or *Paribhashika Virya Vada* (*Dwividha & Ashta Vidha Virya*) 2. *Guṇa Vīrya Vāda* or *Pāribhāṣika Vīrya Vāda*
   - *Virya Karmani (Actions of Virya)Vīrya Karmāṇi*
   - *Virya Upalabdhi Hetavaha (Assessment of Virya)Vīrya Upalabdhi Hetavaha*
   - Clinical application and Research Updates

7. ***Prabhava Vijnana*** **165**
   - *Prabhava Lakshana* (Characteristic Features of *Prabhava*)
   - Concept of *Prabhava* with Various examples
   - Swarupa of *Prabhava*
   - *Prabhava janya Karma* (Actions done by *Prabhava*)
   - Concept of *Samana Pratyarabdha* and *Vichitra Pratyarabdha*
   - *Prakrati Samasamaveta* and *Vikrati Vishama Samaveta*
   - *Prabhava* Visa-Vis *Vicitrapratyarabdatwa*
   - Clinical importance of *Prabhava*

8. **Interrelation of *Rasa-Guna-Virya-Vipaka-Prabhava* with respect to their strength – Pharmacodynamics** **177**

9. ***Karma Vijnana*** **181**
   - *Karma Lakshana* (Characteristics of *Karma*)
   - *Pracina Drishtya Karma Kriya Vivechana* Modern Concept of Drug Action (Pharmacodynamics)Modern Concept of Drug Action (Pharmacodynamics)
   - *Dravya Karmukata Vividha Parikshana*
   - Common Experimental AnimalsCommon Experimental Animals
   - Experimental Models for Select Activities

     9. 1 *Dipana* 9.2 *Pachana* 9.3 *Samshodhana*

     9.4 *Samshamana* 9.5 *Anulomana* 9.6 *Sramsana*

     9.7 *Bhedana* 9.8 *Rechana* 9.9 *Chedana*

9.10 *Lekhana* 9.11 *Grahi* 9.12 *Stambhana*
9.13 *Madakari* 9.14 *Pramathi* 9.15 *Abhishyandi*
9.16 *Vyavayi* 9.17 *Vikasi* 9.18 *Rasayana*
9.19 *Vajeekarana* 9.20 *Medhya*

- Research Updates

10. *Karmas* of *dashemanigana* - *Charakokta Dashemani Karmas* with their *Rasa*, *Guna*, *Vipaka*, *Veerya*, *Dosha karma*, botanical identity & pharmaco-therapeutic action of individual drugs 236

11. Principles of General Pharmacology 277

Drug definition, drug dosage forms, route of drug administration, pharmacokinetics (ADME), pharmacodynamics, Drug dose, principles of drug action, mechanism of drug action & bioavailability

11.1 Drugs Acting on Central Nervous System: Anaesthetics, Sedative Hypnotics, Antiepileptics, Antiparkinsonian, Antidepressants, Antianxiety Drugs, Opioid - Analgesics Drugs

11.2 Drugs Acting on Peripheral (somatic) Nervous System: Skeletal Muscle Relaxants, Local Anaesthetics

11.3 Autacoids and Related Drugs: Nonsteroidal, Anti-inflammatory (NSAIDs)/Antipyretic and Analgesics Drugs

11.4 Drugs for Respiratory Disorders: Bronchodilators, Aerosols/ Inhalants, Expectorants, Antitussive Drugs

11.5 Cardiovascular Drugs: Antihypertensive, Antianginal Drugs

11.6 Drugs Acting on Kidney: Diuretics

11.7 Drugs Affecting Blood: Haematinics, Coagulants, Anticoagulants, Hypolipidaemic Drugs

11.8 Gastrointestinal Drugs: Antacid, Carminatives, Digestants, Antiemetics, Laxatives, Antidiarrhoeal, Hepatoprotective Drugs

11.9 Antibacterial Drugs: Antibiotics, Antitubercular Drugs

11.10 Antifungal, Antiviral, Antimalarial and Antihelmintic Drugs

11.11 Hormones and Related Drugs: Thyroid Hormone, Thyroid Inhibitors, Insulin, Oral Antidiabetic, Hormonal Contraceptives, Uterine Stimulants, Uterine Relaxants Drugs

11.12 Miscellaneous Drugs: Antiseptics and Disinfectants, Vaccines, Vitamins, Water Imbalance and IV fluids

12. *Mishraka Vargikarana* **388**

Introduction to *Mishraka Vargikarana*

1. *Brahat Panchamula*
2. *Laghu Panchamula*
2. a. *Dashamula*
3. *Valli Panchamula*
4. *Kantaka Panchamula*
5. *Trina Panchamula*
6. *Panchavalkala/Panchakshri Vraksha*
7. *Triphala*
8. *Trikatu*
9. *Trimada*
10. *Chaturushana*
11. *Panchakola*
12. *Shadushana*
13. *Chaturbija*
14. *Trijataka*
15. *Chaturjataka*
16. *Panchatikta*
17. *Trikarshika*
18. *Chaturbhadraka*

13. Nomenclature of *Dravya* as per *Nighantu*, Vedic taxonomy and Botany **403**

- Definition of *Dravya Namakarana*
- Modern Botanical Nomenclature
- *Dravya Namakaranasya Adhara & Paryaya Adhara*
- Utility of *Paryaya* in plant identification
- Limitations of *Paryayas* in Identification
- Vedic Taxonomy
- Classification of Plants in *Veda*
- Classification Based On Morphology in *Veda*
- Plant Taxonomy & Nomenclature

14. *Prashasta Bheshaja, Bheshaja Pariksha* and Drug evaluation method with correlation as per Pharmacognosy **414**

- *Prashasta Bheshaja*
- *Bheshaja Pariksha Vidhi*
- Drug Evaluation Methods

15. *Dravyasangrahana* and Drug collection methods as per GFCP (Good Field collection practices) **419**

- Relevance of *Dravya Sangrahana* (Collection of plants)
- *Sangrahita Dravya Swarupa* (Characteristics of collected materials)
- *Sangrahana Vidhi* (Collection methods)
- Collection of Wet or Dry and New or Old Drugs
- *Audbhida Dravya – Avayava BhedaAudbhida Dravya – Avayava Bheda Sangraha Vidhi* (method of collection as per useful parts)
- *Sangraha Kala Jnana* (Knowledge of collection time)
- Collection of used parts acc to season
- *Virya Bhedena Dravyanam Sangrahanam* (Collection of plants as per potency)
- *Dravya Sangrahana as per Bhumi* (Collection according to soil)
- Drug collection methods as per GFCP (Good Field collection practices)
- Guidelines as per Good Field collection practices

16. GCP (Good cultivation practices), Seed bank, Conservation of medicinal plants, knowledge about RET (Rear, Endangered & threatened) medicinal plants **433**

- Meaning of cultivation
- Necessity of cultivation
- Cultivation methods
- Factors affecting cultivation
- Harvesting
- Processing
- Government efforts to promote cultivation
- Good Cultivation Practices (GCP)
- Seed bank
- Knowledge about Rare, Endangered & Threatened (RET) medicinal plants
- The International Union for Conservation of Nature (IUCN)
- Conservation of medicinal plants
- Types of conservation

17. *Abhavapratinidhidravya* (Substitutes) **447**

- *Pratinidhi Dravya* (Substitutes)

- *Abhava pratinidhi dravya* (substitutes) as per Bhavaprakasha.
- List of different species used as a substitute

18. Classifications and techniques of aqueous and alcoholic extracts 455

- Definition of extracts
- Materials required
- Solvent
- Method of preparation
- Types of extracts
- Uses

19. Adverse drug reaction and Pharmacovigilance with recent updates 461

- Adverse drug reaction with recent updates
- Pharmacovigilance
- Origin of Pharmacovigilance monitoring
- Evolution of Pharmacovigilance Programme of India (PvPI)
- Pharmacovigilance programme for Ayurveda, Siddha & Unani (ASU) drugs
- Hierarchy of Pharmacovigilance Program
- Reporting ADR
- *Dravyanam Vairodhika Vichara*
- Types of *Viruddha*
- Diseases due to *Viruddhahara Sevana*

20. NMPB (National Medicinal Plant Board), CCRAS (Central Council of Research in Ayurveda Sciences), API (Ayurvedic Pharmacopeia of India), GCTM (Global Centre for Traditional Medicine), PCIMH (Pharmacopeia Commission of Indian Medicine and Homeopathy) 474

21. Vrikshayurveda and Ethno-medicine 482

- Aurhorship of Vrakshayurveda
- Different Works in the name of Vrakshayurveda
- Contents n 21 sections
- Vrikshayurveda of Parashara (A treatise on Plant Science)
- Definition of Ethnomedicine
- Current scenario of Ethnomedicine

- Ethnomedicinal Plants
- Scope of Ethnomedicine
- Ethnopharmacology

22. Network Pharmacology And Bioinformatics **498**

- Introduction to Network Pharmacology
- Theoretical Fundamentals
- Methodology of Network Pharmacology Research
- Data sources
- Big data analytics
- Network construction and interaction prediction
- Network analysis
- Network visualization
- Applications of Network pharmacology
- Network pharmacology and Ayurveda- Triphala
- Definition of Bioinformatics
- Need of Bioinformatics
- Aim of Bioinformatics
- Components of Bioinformatics
- Database
- Database Mining Tools (Analysis Tools)
- Applications of Bioinformatics
- Exercises on Network Pharmacology

Index 509

Bibliography 516

Question Papers 520

1 Chapter

Introduction to Dravyaguna Shastra

Contents

- *Dravyaguna Shastrasya Lakshanam.*
- *Saptapadartha - Dravya, Rasa, Guna, Virya, Vipaka, Prabhava, Karmani Adinam Samanya Parichaya.*
- *Importance and relevance of Dravyaguna Shastra*

Lakshana of Dravyaguna Shastra

The word, ''*Dravyaguna*'' which is composed of two words *'Dravya'* & *'Guna'* deals with the systemic study of *Guna* (Properties) and *Karma* (Actions) of *Dravya.*

तदायुर्वेदयतीत्यायुर्वेदः, कथमिति चेत्?.........यतश्चायुष्याण्यनायुष्याणि च द्रव्यगुणकर्माणि वेदयत्यतोऽप्यायुर्वेदः। तत्रायुष्याण्यनायुष्याणि च द्रव्यगुणकर्माणि केवलेनोपदेक्ष्यन्ते तन्त्रेण ॥

च.सू. 30/23

In *Cha. Su. 30/23, Agnivesha* in answer to the query as to why the name ''*Ayurveda*'', says that *Ayurveda* is the science which imparts knowledge about *Ayu* (life) through the detailed analysis of *Ayushyani* and *Anayushyani Dravyani* i.e. the substances, its properties and actions that are favorable to promote longevity and unfavorable substances that hamper longevity.

द्रव्याणि पुनरोषधयः। सु. सू. 1/28

In the context of *Ayurvediya Dravyaguna Shastra Dravya* refers to *Karya Dravya* i.e. *Aushadhi Dravya.*

गुण शब्देन चेह धर्मवाचिना रसवीर्यविपाकप्रभावाः सर्व एव गृह्यन्ते। चक्रपाणि–च.सू. 1/59-61

The term *Guna,* here indicates and includes *Guna, Rasa, Virya, Vipaka* and *Prabhava.*

द्रव्याणां गुणकर्माणि प्रयोगाः विविधास्तथा। सर्वशो यत्र वर्ण्यन्ते शास्त्रं द्रव्यगुणं हि तत् ॥

द्र.गु.वि.

Thus, as one of the recent renowned professors puts it, *Dravyaguna Shastra* is the science which deals with the thorough analysis of the properties (*Guna*), actions (*Karma*) and therapeutics (*Prayoga*) of all *Dravyas* which are either *Ahara* or *Aushadha.*

Panchapadartha of Dravyaguna

Bhavamishra, the author of *Bhavaprakasha Nighantu* quotes five *Padarthas* (*Panca Padartha*) which reside in a *Dravya.*

द्रव्ये रसोगुणोवीर्यं विपाकः शक्तिरेव च। पदार्था पञ्चतिष्ठन्ति स्वं स्वं कुर्वन्ति कर्म च ॥

भा. प्र. प्र. 6/169

Rasa, Guna, Virya, Vipaka and *Prabhava* (*Shakti*) are the five *Padarthas* which take shelter in the *Dravya* and perform their respective *Karma.*

Sapta Padarthas of *Dravyaguna*

Prof. Yadavji Trikamji Acharya adds *Dravya* and *Karma* to the *Panchapadarthas* and thus refers to *Sapta Padarthas.*

The *Sapta Padarthas* are:

Dravya	Rasa
Guna	Virya
Vipaka	*Prabhava* (*Shakti*)

Karma

These seven constitutes for the fundamental basis for understanding *Dravya,* its mode of action and therapeutics. In depth knowledge of these seven basic principles helps in practical utility.

Dravya

यत्राश्रिताः कर्मगुणाः कारणं समवायि यत्। तद्द्रव्यं.......................................॥

च. सू. 1/51

Dravya is a substance which shelters *Karma* (Action) and *Guna* (*Properties*) and maintains a *Samavaya Sambandha* (inherent relation) with *Karma* and *Guna. Dravya* is the material cause. e.g. *Guduchi, Amalaki, Ashwagandha* etc.

Guna

समवायी तु निश्चेष्टःकारणं गुणः। च. सू. 1/51

Guna takes shelter in a *Dravya* and remains in *Samavaya Sambandha* (inherent relation) with it; *Guna* forms the *Asamavayi Karana* for *Karma* and is inactive without the help of other factors.

Though the term *'Guna'* has several meanings, in this context, physical properties of a substance are more suitable.

e.g. *Ushna* (Hot), *Shita* (Cold) etc.

सार्था गुर्वादयो बुद्धिः प्रयत्नान्ताः परादयः। गुणाःप्रोक्ताः..............................॥

च. सू. 1/49

Totally, 41 *Gunas* are considered in *Ayurveda.*

Rasa

रसनार्थो रसस्तस्य द्रव्यमापः क्षितिस्तथा। निर्वृत्तौ च विशेषे च प्रत्ययाः खादयस्त्रयः॥

च. सू. 1/64

रस्यत आस्वाद्यत इति रसः। चक्रपाणि (च. सू.-1/64)

Rasa (taste) is the object of *Rasanendriya* (Gustatory sense organ). *Ap* and *Prithvi* are the fundamental *Mahabhutas* responsible in the manifestation of *Rasa* (taste), while the rest, i.e. *Akasha, Vayu* and *Tejas* are the causative factors.

स्वादुरम्लोऽथ लवणः कटुकस्तिक्त एव च। कषायश्चेति षट्कोऽयं रसानां संग्रहः स्मृतः॥

च. सू. 1/65

Swadu (Sweet), *Amla* (Sour), *Lavana (*Salt), *Katu* (Pungent), *Tikta* (Bitter) and *Kashaya* (Astringent) are the *Shat Rasas* accepted in *Ayurveda.*

Vipaka

जाठरेणाग्निना योगाद्यदुदेति रसान्तरम्। रसानां परिणामान्ते स विपाक इतिस्मृतः॥

अ. हृ. सू. 9/20

अवस्थापाकापेक्षया विशिष्टः पाकः विपाकः। शिवदास

The transformed *Rasa* at the end of the digestion under the influence of *Jatharagni* is known as *Vipaka.* This *Vipaka* is different compared to *Avasthapaka.*

त्रिधा विपाको द्रव्यस्य स्वाद्वम्ल कटुकात्मकः॥ अ. हृ. सू. 1/17

Ayurveda advocates 3 *Vipakas–Madhura, Amla* and *Katu.*

Virya

वीर्यं तु क्रियते येन या क्रिया। नावीर्यं कुरुते किञ्चित् सर्वा वीर्यकृता क्रियाः॥

च. सू. 26/65

The property of a *Dravya,* which is responsible for the therapeutic effects. There is no action without the involvement of *Virya* (Potency).

उष्णशीतगुणोत्कर्षात् तत्र वीर्यं द्विधा स्मृतम्॥ अ. हृ. सू. 1/17

Virya are of two types i.e. *Ushna* and *Shita.*

Prabhava

रसवीर्यविपाकानां सामान्यं यत्र लक्ष्यते। विशेषः कर्मणां चैव प्रभावस्तस्य स स्मृतः॥

च. सू. 26/67

The special action brought about by the *Dravya,* which is not in accordance with its *Rasa, Guna, Virya* or *Vipaka* is known as *Prabhava.* Eg: *Krimighna* action of *Vidanga.*

Karma

संयोगे च विभागे च कारणं द्रव्यमाश्रितम्। कर्तव्यस्य क्रिया कर्म, कर्म नान्यदपेक्षते ॥

च. सू. 1/52

The factor responsible for *Samyoga* (Association) and *Vibhaga* (Dissociation) of *Dravyas* is known as *Karma. Karma* of a *Dravya* is accomplished by *Rasadi Panchaka* (*Rasa, Guna, Vipaka, Virya* & *Prabhava*) itself. E.g. *Dipana.*

Importance and Relevance of Dravyaguna Shastra / Vijnana

Dravyaguna is one of the significant disciplines of Ayurveda which is very much important to all persons who are working in the field of Ayurveda.

हेतु लिङ्गौषधज्ञानं स्वस्थातुरपरायणम्। च. सू. 1/24

Thorough knowledge of *Dravya* becomes extremely important for the maintenance of health. This knowledge is obtained from *Dravyaguna Shastra.*

Hetu (Causative factors), *Linga* (Symptoms) and *Aushadha* (Medicines) are *Trisutra* (Aphorisms) of *Ayurveda. Aushadha* (Medicine) is one among these three. Hence in-depth and systematic knowledge of *Aushadha* (Medicine) is indispensable for *Swastha* (Healthy) and *Atura* (Diseased). For successful treatment co-ordination and co-existence of *Chatushpada* is extremely essential. They are *Bhishak* (Physician), *Dravya* (Medicines), *Upasthata* (Nurse/Attendar) and *Rogi* (Patient) which form the four limbs of treatment. Logical application of *Dravyas* is mandatory for the best treatment and hence a detailed knowledge of *Dravyas* its properties takes prime importance. Understanding of the fundamental principles of Dravyaguna *Vijnana* will help to select the proper drug as per the disease. The systematic learning of medicinal plants gives various options to *Vaidya* to practice Ayurveda with lot of confidence.

Dravya jnana (Knowledge of medicinal plants), *Guna jnana* (Knowledge on properties) and *Karma jnana* (Knowledge on actions) are very much important for an *Ayurveda Vaidya* to extend best possible health care services to the needy. One can utilize *Dravyas* judiciously for treatment only when one is diligent with the knowledge of drugs. And for this, knowledge of basic principles like *Sapta padartha* of Dravyaguna (*Dravya*, *Guna*, *Rasa*, *Vipaka*, *Virya*, *Prabhava* and *Karma*) which govern *Dravyas* is equally important.

Dravyaguna is essential to Academicians, Clinicians, Researchers, Pharmacy persons, policy makers, medicinal plant cultivators and collectors etc.

Exercises: MCQ (Multiple choice Questions)

1. In the context of Ayurvediya Dravyaguna Shastra explained by Sushrutacharya the Karya Dravya refers to

   a. Karana Dravya b. Aushadha Dravya

   c. Guna d. Karma

   Ans: b – Aushadha Dravya

2. Trisutra of Ayurveda does not include

   a. Hetu b. Aushadha

   c. Manas d. Linga

   Ans: c. – Manas

3. Pancha Padartha in Dravya as per Bhavaprakasha Nighantu

   a. Rasa, Guna, Virya, Vipaka and Prabhava (Shakti)

   b. Rasa, Karma, Virya, Vipaka and Prabhava (Shakti)

   c. Rasa, Guna, Virya, Vipaka and Dravya

   d. Rasa, Guna, Vipaka and Prabhava (Shakti)

   Ans: a - Rasa, Guna, Virya, Vipaka and Prabhava (Shakti)

4. Sapta Padarthas of Dravyaguna as per Yadavaji Trikamaji Acharya

   a. Dravya, Guna, Karma, Samanya, Vishesha, Samavaya and Abhava

   b. Dravya, Guna, Rasa, Vipaka, Virya, Prabhava and Karma

   c. Dravya, Guna, Rasa, Vipaka, Virya, Abhava and Karma

   d. Dravya, Guna, Karma, Vipaka, Virya, Prabhava and Samanya

   Ans: b - Dravya, Guna, Rasa, Vipaka, Virya, Prabhava and Karma

5. Chikitsa Chatushpada includes

   a. Bhishak, Dravya, Nighantu and Rogi

   b. Bhishak, Dravya, Upasthata and Bheshajagara

   c. Bhishak, Bheshajagara, Upasthata and Rogi

   d. Bhishak, Dravya, Upasthata and Rogi

   Ans: d - Bhishak, Dravya, Upasthata and Rogi

***

2 Chapter

Dravya Vijnana

Contents

- *Dravya Lakshna*
- *Panchabhoutikatwa of Dravya*
- *Dravya Aushadhatva*
- Classification of *Dravya* based on *Utpatti*
- Classification of *Dravya* based on *Yoni*
- Classification of *Dravya* based on *Prayoga*
- Classification of *Dravya* based on *Prabhava*
- Classification of *Dravya* based on *Doshaghna*
- Classification of *Dravya* based on *Rasabheda*
- Classification of *Dravya* based on *Karmabheda*
- *Gana* as per Sushruta Samhita and Ashtanga Hridaya

Dravya Lakshana (Characteristics of Dravya)

1. यत्राश्रिताः कर्मगुणाः कारणं समवायि यत् । तद्द्रव्यं । च. सू. 1/51

यत्राश्रिताः यत्र समवेताः (समवाय सम्बन्धेन स्थिताः) । कर्म च गुणाश्च कर्म गुणाः । कारणं समवायि यदिति समवायि कारणं यत्, द्रव्यमेव हि द्रव्यगुणकर्मणां समवायिकारणम् । समवायिकारणं च यद् यत् स्वसमवेतं कार्यं जनयति; गुणकर्मणी तु न स्वसमवेतं कार्यं जनयतः, अतो न ते समवायिकारणे । चक्रदत्त दह च. सू. 1/51

Dravya is the substratum which shelters *Guna* (quality) and *Karma* (action) and has *Samavaya Sambandha* (inherent relationship) with them. Dravya has the ability to perform action independently while *Guna, Karma* cannot perform an action without the assistance of *Dravya.*

2. क्रियागुणवत् समवायि कारणं द्रव्यम् । सु. सू. 40/3

क्रियागुणवदिति क्रियागुणवद्द्व्यमित्यर्थः क्रिया कर्म, गुणा उक्ता विंशतिः । समवायि कारणमपि द्रव्यमेव; यथा पटे तन्तवः, घटे मृत्पिण्ड इत्यादि; न च क्रियायां क्रिया समवेता, न गुणेषु गुणाश्च समवेता इति । डल्हण on सु. सू. 40/3

Acharya Sushruta also defines *'Dravya'* in a similar manner, saying that *Guna* (Quality) and *Karma* (Action) are in an inherent relationship with the *Dravya.*

3. क्रियागुणवत् समवायि कारणं द्रव्यम् । वै. द. 1/15

Vaisheshika Darshana defines *'Dravya'* as one which has *Samavaya Sambandha* (inherent relationship) with *Guna* (Quality) and *Karma* (Action).

4. द्रव्यमाश्रयलक्षणं पञ्चानाम् । र. वै.

भाष्य-रसादीनां पञ्चानां भूतानां यदाश्रयभूतं तद् द्रव्यम् ।

Badanta Nagarjuna defined *Dravya* as that which shelters the 5 factors i.e. *Rasa, Guna, Virya, Vipaka* and *Prabhava.*

5. द्रव्ये रसो गुणो वीर्यं विपाकः शक्तिरेव च ।

पदार्थाः पञ्चतिष्ठन्ति स्वं स्वं कुर्वन्ति कर्म च ॥ भा. प्र. प्र. 6/169

Dravya is one which gives shelter to *Pancapadarthas* namely *Rasa, Guna, Virya, Vipaka* and *Shakti (Prabhava)* which in turn perform their own actions.

Panchabhautikatwa of Dravya

Panchamahabhta theory is one of the fundamental theories accepted in *Ayurveda.*

सर्वं द्रव्यं पाञ्चभौतिकमस्मिन्नर्थे । च. सू. 26/10

सर्वद्रव्यमिति कार्यद्रव्यम् । अस्मिन्नर्थे अस्मिन् प्रकरणे । चक्रपाणि-च. सू. 26/10

Caraka advocates that all *Dravyas* (substances) in this universe are composed of *Panchamahabhuta.* In this context, *'Sarva Dravya'* refers to *Karya Dravyas* only.

तत्र प्रथिव्यप्तेजोवाय्वाकाशानां समुदायाद्द्रव्यभिनिर्वृत्तिः, उत्कर्षस्त्वभिव्यञ्जको भवति-इदं पार्थिवमिदमाप्यमिदं तैजसमिदं वायव्यमिदमाकाशीयमिति । सु. सू. 41/3

Dravya is formed by an appropriate combination of *Prithvi, Ap, Teja, Vayu* & *Akasha Mahabhuta.* Even though *Dravya* is composed of *Panchamahabhutas,* depending on the *Pradhanyata* of *Mahabhuta,* the *Dravyas* are classified into *Parthiva, Apya, Agneya, Vayavya* and *Akashiya.*

पाञ्चभौतिकमिति प्रथिव्यादिभिः पञ्चभिर्भूतैर्भिर्मिलितैराब्धमित्यर्थः प्रकरणान्तरे यद्यपि पञ्चभूतात्मनः काल दिशां नवानमपिकारण द्रव्याणां द्रव्यशब्देन ग्रहणं भवति, तथाऽप्यस्मिन् द्रव्यगुणाधिकारे 'द्रव्यं' शब्देन औषधाहारोपयोगीनि पाञ्चभौतिकानि गुडूचीगोधूमादीनि कार्य द्रव्याण्येवाभिप्रेतनीत्यर्थः । द्र. गु. वि. (Y.T.A)

सर्वकार्यद्रव्याणां पञ्चभूतारब्धत्त्वं दर्शयित्वा चिकित्सोपयुक्तं पार्थिवत्वादि विशेषमाह-तत्रेत्त्यादि समुदायादिति मेलकात् । पृथिवी जलानिलदीनां च यद्यपि विरुद्ध गुणत्वं तथाऽप्यदृष्टवशादेकद्रव्यरूपकार्यारम्भकत्वं, द्रष्टत्त्वादेव भवति । यथा वातादीनामेक व्याध्यारम्भकत्वं शुक्रशोणितन्योर्वा सौम्याग्नेययोर्गर्भजनकत्वं, सत्वरजतमसां वा मदाद्यारम्भकत्त्वम् । उत्कर्ष प्रत्येकं पृथिव्याद्युत्कर्षः । अभिव्यञ्जक इति पार्थिवत्वाद्यभिव्यञ्जकः तमेवाह इदमित्त्यादि । च. द.

All the *Karya Dravyas* are made of *Panchamahabhutas,* they are classified as *Parthiva, Apya, Agneya, Vayavya* and *Akashiya* for the purpose of treatment.

पञ्चभूतात्मकं तत्तु क्ष्मामधिष्ठाय जायते । अम्बुयोन्यग्निपवननभसां समवायतः ।
तन्निर्वृत्तिर्विशेषश्च, व्यपदेशस्तु भूयसा ॥ अ. हृ. सू. 9/1-2

Of the 5 *Bhutas, Prithvi* becomes the *Adhishthana* or *Ashraya, Jala Mahabhuta* forms the *Yoni,* i.e. it combines the particles in the *Dravya* and *Akasha, Vayu* and *Agni Mahabhutas* together combine to give a structure to the *Dravya.*

तुरवधारणे । यत्तदोश्च नित्याभिसम्बन्धात् 'यत्' इत्येदनुकतमप्यर्थाल्लभ्यते । तेनायमर्थः- यद्रसादीनामाश्रय भूतं कार्यद्रंव्यं हरीतवहयादि स्थावरं, छागादि वा जङ्गमं, सैन्धवादि वा पार्थिवं तत् पञ्चभूतात्मकं, न तु यत् कारणं द्रव्यमाकाशादि । तस्य हि पञ्चभूतात्मकत्वे सत्याकाशादीनां पृथक्त्वेनात्मलाभो न स्यात् । ततश्चेद-माकाशं नाम महाभूतम्, इदं पृथ्वी नाम महाभूतमिति गदितुं न पार्येत्, सर्वस्य पञ्चमहाभूतात्मकत्वात् । न च यत् कारणं तत् कदाचित् कार्यं स्यात् । तस्मात् कार्यद्रव्यस्यैव पञ्चभूतात्मकत्वं, न च कारणद्रव्यस्याऽकाशादेः । अथ केन महाभूतेन कथं कृत्वाऽऽरब्धं तद् द्रव्यमित्याह-क्ष्मामित्यादि । पृथिवीमाधारीकृत्योत्पद्यते । एवं पृथिव्याख्येन भूतेनाऽऽधारत्वेनोपकृत्य तेन तदारब्धं द्रव्यमित्युच्यते । तथा, अम्बु सलिलं, योनिः कारणं, यस्य तदम्बुयोनि द्रव्यम् । एवं जलं नाम महाभूतं रसवत्वाद्योनितयोपकृत्य तेन तदारब्धमित्युच्यते । तथा अग्नि पवन नभसां समवायात् अपृथग्भावात्, तस्य द्रव्यस्य निर्वत्तिः निष्पत्तिः । तथा तस्य द्रव्यस्य यो विशेषः इदमन्यदिदमन्यद् द्रव्यमित्येवं रूपो नानास्वभावः सोऽप्यग्नि पवननभसां समवायात् । एवमग्नि पवननभोभिः समवायि कारणत्वेनोपकृत्य तैरेतद् द्रव्यमारब्धामित्युच्यते । एवं च सर्वं कार्यद्रव्यं पञ्चमहाभूतात्मकं, पञ्चभिर्महाभूतैरारब्धत्वात् । अरुण दत्तः-अ. हृ. सू.-9/1-2

द्रव्योत्पत्तिमाह-तत्त्विति । तद् द्रव्यं क्ष्मां पृथिवीमधिष्ठाय जायते, मृदमिव घटः, उपादान कारणं पृथ्वीत्यर्थः । अम्बु-उदकं, योनिर्विपरिणामकारणं यस्य तदम्बुयोनिः । यथा, घटे निष्पाद्ये मृदः पिण्डीभावादौ । अग्न्यादीनां सम्बन्धात् तन्निर्वृत्तिः सम्पूर्णावयवत्वम्, काठिन्यक्रियावकाशादिदानेन । विशेषः परस्परं, सोऽपि तत् राव । यथा पिण्डीभूताया मृदो मणिककरकशरावादि भेदः ।

हेमाद्रि-अ. हृ. सू.-9/1-2

पञ्चभूतात्मके देहे आहारः पाञ्चभौतिकः । विपवहवः पञ्चधा सम्यग्गुणान् स्वानभिवर्धयेत् ॥

सु. सू. 46/526

Panchabhautika Sharira digests the consumed *Panchabhautika Ahara* and assimilates into the respective *Panchabhautika* constituents of the body.

भूतेभ्यो हि परं यस्मान्नास्ति चिन्ता चिकित्सिते । सु. शा. 1/13

A *Vaidya* with a sound knowledge of *Panchabhautikatva* of *Dravyas* need not worry to treat *Vyadhis*.

If one observes the *Srashtikrama,* it is evident that all *Dravyas* are an outcome of *Panchamahabhuta* only. *Panchamahabhuta* becomes an inborn constituent of every *Dravya* on this universe.

आकाशादीनि भूतानि सर्वाण्येकगुणान्यथ । महाभूतेषु जन्मेषु गुणवृद्धिः प्रजायते ॥
एकद्वित्रिचतुःपञ्चगुणत्वं खादिषु स्मृतम् । गुणस्तत्रैक आत्मीयः शेषः संसर्गजः स्मृतः ॥
अन्योन्यानुप्रविष्टाति दृश्यभूतानि निर्दिशेत् । तस्मात् पञ्चगुणान्येव सर्वाणीति विनिश्चयः ॥

पं. भू.

Avyakta
↓
Mahan
↓
Ahamkara

Satwika | Rajasika | Tamasika

Rajasika + Tamasika
↓
Panchatanmatra
(Shabda, Sparsha, Rupa, Rasa & Gandha)
↓
Panchamahabhuta
(Akasha, Vayu, Agni, Ap & Prithvi)
↓
Karyadravyas

अन्योऽन्यानुप्रविष्टानि सर्वाण्येतानि निर्दिशेत् । स्वेस्वे द्रव्येतु सर्वेषां व्यक्तं लक्षणमिष्यते ॥

सु. शा. 1/21

महाभूतानि खं वायुरग्निरापः क्षितिस्तथा । शब्दःस्पर्शश्चरूपं च रसो गन्धश्च तद्गुणाः ॥
तेषोमेकगुणः पूर्वो गुणवृदिः परे परे । पूर्वः पूर्वगुणश्चैव क्रमशो गुणिषु स्मृतः ॥

च. शा. 1/27-28

Akasha Mahabhuta has only *Shabda Guna* as its *Pratyatma Guna.* Based on the principle of *Anyonyanupravesha* each succeeding *Mahabhutas* will encompass one additional *Guna.* Thus *Vayu Mahabhuta* has *Sparsha* as its *Pratyatma Guna* along with *Shabda Guna.* Finally, *Prithvi Mahabhuta* comprises five qualities i.e. *Shabda, Sparsha, Rupa, Rasa & Gandha.*

Dravya Aushadhatwa

अनेनोपदेशेन नानौषधिभूतं जगति किञ्चिद्रव्यमुपलभ्यते तां तां युक्तिमर्थं च तं तमभिप्रेत्य ।
च. सू. 26/12

अनेन निदर्शनेन नानौषधिभूतं जगति किञ्चिद्रव्यमस्तिः । सु. सू. 41/5

रसादि भेदैरिति भेषजानां दिङ्मात्रमुक्तं न यतोऽस्ति किञ्चित् अनौषधं द्रव्यमिह......... ।
अ.सं. सू. 12/12

All the *Karyadravyas* are *Aushadha,* there is no *Karyadravya* in this universe which is devoid of medicinal properties. These *Dravyas* needs to be used acc to one's *Yukti* and *Artha.* In this context *Yukti* means using the *Dravyas* for the purpose of *Aushadha* in the form of *Swarasa, Kalka* etc. and *Artha* means using the *Dravyas* for the purpose of treatment to perform *Vamanadi Karma.*

इत्थं च नानौषधीभूतं जगति किञ्चिद् द्रव्यमस्ति विविधार्थप्रयोगवशात् ।
अ. सं. सू. 17/20

There are no plants in this universe which are devoid of medicinal properties. But one should know proper usage of plants.

भिषग्द्रव्याण्युपस्थाता रोगी पादचतुष्टयम् । च. सू. 9/3

Four factors which are essential for the *Cikitsa* (Treatment) are *Bhishak* (Doctor), *Dravya* (Substance/drug) *Upsthata* (Attender) and *Rogi* (Patient). Among these four, *Dravya* is mentioned 2nd only to *Bhishak,* because of the *Aushadhatwa* (Medicinal properties).

बहुतातत्रयोग्यत्वमनेकविधकल्पना । संपच्चेति चतुष्कोऽयं द्रव्याणां गुण उच्यते ॥
च. सू. 9/7

A *Dravya* can be utilized for *Chikitsa,* only when it possesses these four important characteristics. Those are:

(i) *Bahuta* - Commonly and abundantly available.

(ii) *Yogyatva* - Should be apt in the given conditions.

(iii) *Aneka Vidha Klpana* - Can be utilized in different forms.

(iv) *Sampath* - Should have best therapeutic qualities.

द्रव्यरसगुणवीर्यविपाकनिमित्ते च क्षयवृद्धी दोषाणां साम्यञ्च । सु. सू. 46/3

Suśruta is of the opinion that the condition of the *Doshas (Kshaya-Vraddhi & Samya)* in the body depends on the *Rasadi Gunas (Rasa, Guna, Virya & Vipaka).*

गुणा या उक्ता द्रव्येषु शरीरेष्वपि ते तथा । स्थानवृद्धिक्षयास्तस्माद् देहिनां द्रव्यहेतुकाः ॥

सु. सू. 42/12

The qualities present in the *Dravyas* are also present in the human body; hence it is the *Dravya* which is responsible for *Vraddhi* (increase) and *Kshaya* (decrease) of *Dosha.*

योगादपि विषं तीक्ष्णं उत्तमं भेषजं भवेत् । भेषजं चापि दुर्युक्तं तीक्ष्णं सम्पद्यते विषम् ॥

च. सू. 1/126

Even a poisonous drug, when used skillfully becomes the best medicine and the best medicine when improperly administered transforms into poison.

Classification of Dravya acc to Utpatti Bheda

The *Dravyas* used in the treatment are made up of *Panchamahabhuta.* Eventhough all have *Panchabhuta Amshas,* depending on the *Utkarsha* (predominance) of the *Mahabhuta* the *Dravyas* are categorised into 5 divisions. ' 'व्यपदेशस्तु भूयसा'' (सु. सू. 41). Moreover, the main characteristic feature of the *Dravya* is brought by the predominant *Mahabhuta.*

Dravya
- Parthiva Dravya
- Apya Dravya
- Agneya Dravya
- Vayavya Dravya
- Akashiya Dravya

पार्थिव द्रव्य : तत्र द्रव्याणि गुरुखरकठिनमन्दस्थिरविशदसान्द्रस्थूलगन्धगुण बहुलानि पार्थिवानि, तान्युपचयसंघातगौरव स्थैर्यकराणि; । च. सू. 26/11

जलीय द्रव्य : द्रवस्निग्धशीतमन्दमृदुपिच्छिलरसगुणबहुलात्याप्यानि, तान्युप-वहलेदस्नेहबन्धविष्यन्दमार्दवप्रह्लादकराणि । च. सू. 26/11

तैजस द्रव्य : उष्णतीक्ष्णसूक्ष्मलघुरुक्षविशदरुपगुणबहुलान्यग्नेयानि, तानि दाहपाकप्रभाप्रकाशवर्णकराणि; च. सू. 26/11

वायव्य द्रव्य : लघुशीतरुक्ष खरविशदसूक्ष्मस्पर्शगुणबहुलानि वायव्यानि, तानि रौक्ष्यग्लानिविचारवैशद्यलाघवकराणि । च. सू. 26/11

आकाशीय द्रव्य : मृदुलघुसूक्ष्मश्लक्ष्णशब्दगुणबहुलान्याकांशात्मकानि, तानि मार्दवसौषिर्यलाघवकराणि । च. सू. 26/11

Sl. No.	*Varga*	*Indriyartha*	*Guna*	*Karma*	*Vipaka*
1.	*Parthiva*	*Gandha*	*Guru, Khara, Kathina, Manda, Sthira, Vishada Sthula*	*Upacaya, Sanghata, Gaurava Sthairya Kara*	*Guru*
2.	*Apya*	*Rasa*	*Drava Snigdha, Shita, Manda, Mridu, Picchila*	*Upakleda, Snehana, Bandhana Vishyand-ana Mardavakara Prahladaka*	*Guru*
3.	*Taijasa*	*Rupa*	*Ushna, Tikshna Sukshma Laghu Ruksha Vishada khara*	*Dahakara Pakakara Prabhavarna Kara*	*Laghu*
4.	*Vayavya*	*Sparsha*	*Laghu Shita Ruksha Khara Vishada Sukshma*	*Roukshya Glani Vaishadya Laghavakara*	*Laghu*
5.	*Akashiya*	*Shabda*	*Mradu Laghu Sukshma Shlakshna*	*Mardavakara Soush-irya Laghavatara*	*Laghu*

पार्थिव द्रव्य : तत्र, स्थूलसारसान्द्रमन्दस्थिरखरगुरुकठ्ठिनगन्धबहुलमीषत्कषाय प्रायशो मधुरमिति पर्थिवम् । तत् स्थैर्य्यबल गौरव सङ्घातोपचयकरं विशेषत-श्चाधोगतिस्वभावमिति । सु. सू. 41/4

जलीय द्रव्य : शीतस्तिमितस्निग्धमन्दगुरुसरसान्द्रमृदुपिच्छिलं रसबहुलमीषत्कषायाम्ललवणं मधुररसप्रायमाप्यम् । तत् स्नेहनह्लादन वहलेदनबन्धनविष्यन्दनकरमिति ॥ सु. सू. 41/5

तैजस द्रव्य : उष्णातीक्ष्णसूक्ष्मरुक्षखरलघुविशदंरूपगुणबहुलमीषदम्ललवणं कटुकरसप्रायं विशेषतश्चोर्ध्वगतिस्वभावमिति तैजसम् । तद्दह्नपचनदारणतापनप्रकाशन-प्रभावर्णकरमिति । सु. सू. 41/6

वायव्य द्रव्य : सूक्ष्मरुक्षखरशिशिरलघुविशदंस्पर्शबहुलमीषतिक्तं विशेषतः कषायमिति वायवीयम् । तद्वैशद्यलाघवग्लपनविरुक्षणविचारणकरमिति । सु. सू. 41/7

आकाशीय : श्लक्ष्णसूक्ष्ममृदुव्यवायिविशदविबिक्तमव्यक्तरसंशब्दबहुल द्रव्यमाकाशीयम् तन्मार्दवसौषिर्य्यलाघवकपूमिति । सु. सू . 41/8

तत्र, पृथिव्यप्तेजीवाय्वाकाशानां समुदायाद् द्रव्यभिनिवृत्तिः, उत्कर्षस्त्वभिव्यञ्जको भवति इदं पार्थिवमिदमाप्यमिदं वायव्यमिदमाकाशीयमिति । सु. सू. 41/3

Sl. No.	*Varga*	*Indriya-rtha*	*Rasa*	*Guna*	*Karma*	*Vipaka*
1.	*Parthiva*	*Gandha*	*Madhura Ishat Kashaya*	*Sthula Sandra Manda, Sthira, Khara, Guru, Kathina, Gandha*	*Sthairya Kara Gaurava Balaka-ra Sanghatakara, Upacaya, Adho-gami*	*Guru*
2.	*Apya*	*Rasa*	*Madhura Ishatkas-haya Amla, Lavana*	*Shita, Snigdha Manda, Guru, Sara Sandra Mridu, Picchila*	*Snehana Hlad-ana Kledana Bandhana, Vishyandana*	*Guru*
3.	*Taijasa*	*Rupa*	*Katu Ishat Amla Ishat Lavana*	*Ushna, Tikshna Sukshma Ruksha Laghu Vishada*	*Urdhwagami Dahakara Pac-haka Darana Tapana Prabh-avarna Kara*	*Laghu*
4.	*Vayavya*	*Sparsha*	*Kashaya Ishat Tikta*	*Sukshma Ruksha Khara Shita Laghu Vishada*	*Laghavakara Glapana Virukshana Vicharana*	*Laghu*
5.	*Akashiya*	*Shabda*	*Avyakta*	*Shlakshna Sukshma Mradu Vyavayi Vishada*	*Mardavakara Soushirya Kara Laghavakara*	*Laghu*

2. *Classification of* Dravya *acc to Source* (योनि भेद)

तत्पुनस्त्रिविधं प्रोक्तं जाङ्गमौद्भिदपार्थिवम् । च. सू. 1/68

......द्रव्याणि पुनरोषधयः । तासु द्विविधः-स्थावरा जाङ्गमश्च । सु. सू. 1/28

Charaka divided the *Dravya* into 3 divisions on the basis of source.

Dravya —
- *Jangama*
- *Oudbhida*
- *Parthiva*

Sushruta has mentioned only two types on the basis of source.

Dravya —
- *Sthavara*
- *Jangama*

Sthavara Dravya

उद्भिद्य पृथिवीं जायते इति औद्भिदम् । (च. द.-च. सू.-1/68)

Oudbhida Dravyas are of herbal source and which sprouts and grows by piercing the soil.

E.g. *Haritaki, Amalaki*

..........औद्भिदं तु चतुर्विधम् । वनस्पतिस्तथा दीरूद्वानस्पत्यस्तथौषधिः ॥
फलैर्वनस्पतिः पुष्पैर्वानस्पत्यः फलैरपि । ओषध्यः फलपाकान्ताः प्रतानैर्वीरुधः स्मृताः ।
च. सू. 1/71-72

Oudbhida Dravyas are again classified into 4 types on the basis of their nature.

Oudbhida Dravya
- *Vanaspati*
- *Virudha*
- *Vanaspatya*
- *Oushadhi*

Sthavara Dravya
- *Vanaspati*
- *Vriksha*
- *Virudha*
- *Oushadha*

i) Vanaspati

फलैर्वनस्पतिरिति विनापुष्पैः फलैर्युक्ता वटोदुम्बरादयः । च. सू. 1-72 (चक्रपाणि)

अपुष्पा इति अविद्यमानपुष्पाः फलवन्त इति फलं येषामस्ति ते वनस्पतय इतिः के पुनरीदृशाः? प्लाक्षोदुम्बरादयः । सु. सू. 1/29 (डल्हण)

अपुष्पा इति पुष्पाणामतिसूक्ष्मतया पुष्पाधारकर्णिकया (Receptacles) **आच्छादितत्वाच्च अदृश्यपुष्पा इत्यर्थः ।** Y. T. Acharya.

The plants which will not have visible flowers are included under *Vanaspati.*

E.g. *Vata, Udumbara, Plaksha* etc.

The plants which will not have visible flowers but appears it never had flowers before fruiting are included under *Vanaspati.*

E.g. *Udumbara (Ficus glomerata), Plaksha (Ficus lacor)* etc.

ii) Virudha

प्रतानशब्देन लतागुल्माश्च ग्रान्ते । च. सू. 1/72 (चक्रपाणि)

लता गुल्माश्च वीरुधः । हारीत

प्रतानवत्य इत्यादि प्रतानवत्यो विस्तारवत्यः वीरुधः, न केवलं प्रतानवत्यो वीरुधः स्तखिलन्यश्च गुल्मिन्यश्च, गुल्म पुनः वर्तुललतासन्ततिविटपः ताश्च विदारीकोलवल्ली शालपर्णी-पृश्निपर्णीप्रभृतयः । सु. सू. 1/29 (डल्हण)

Those plants which are weak stemmed are known as *Virudha. Virudha* is of two types (1) *Lata* and (2) *Gulma.*

Lata - Climbers, *Amrita (Tinospora cordifolia), Jivanti (Leptadenia reticulata).*

Gulma - Shrubs, *Karavira (Nerium odorum)*

iii) Vanaspatya

पुष्पैर्वानस्पत्यः फलैरपीति पुष्पानन्तरं फलभाज इत्यर्थः । च. सू. 1/72 (चक्रपाणि)

The plants which bear visible flowers and then bear fruits are called *Vanaspati.*

E.g. *Amra* (Mango), *Jambu* (Jamun)

iv) Vriksha

पुष्पफलवन्तो वृक्षा इति उभययुक्ता वृक्षाः के ते? आम्रजम्बुप्रभृतयः । सु. सू. 1/29 (डल्हण)

The plants which bear visible flowers and then bear fruits are called *''Vriksha''*.

E.g. *Amra (Mangifera indica), Jambu (Eugenia jambolana)*

v) *Oushadhi/Oshadhi*

फलस्य पाकादन्तो विनाशो येषां तिलमुद्गादीनां ते फलपाकान्ताः । च. सू. 1/72 (चक्रपाणि)

फलपाकनिष्ठा इति निष्ठानाशः फलपाकेन परिणत्या नाशो यासां तास्तथोक्ताः, ते पुनर्गोधूमादयः । अन्य तु निष्ठाशब्दं प्रत्येकं संवघ्नन्ति, फलनिष्ठा पाकनिष्ठा इतिः तत्र फलनिष्ठाः शालितिलकुलत्थादयः, पाकनिष्ठाःकवकादयः कवकश्छात्रक उच्यते । सु. सू. 1/29 (डल्हण)

The plants which dry and end its life by giving fruits are called *Oushadhi.*

E.g. *Tila* (*Sesamum indicum*), *Mudga, Godhuma* (Wheat).

The plant once grow will also die without giving fruit.

E.g. *Durva (Cynodon dactylon)*

The plants which dry and end its life by giving fruits are called *Oushadhi.*

E.g. *Shali* (*Oryza sativa*), *Tila* (*Sesamum indicum*), *Kulattha (Dolichos biflorus) etc.*

The plant once grow will also die without giving fruit.

E.g. *Chatraka (Agaricus campestris)*

Oudbhida Gana

मूलत्वक्सारनिर्यासनाल(उ) स्वरसपल्लवाः । क्षाराः क्षीरं फलं पुष्पं भस्मतैलानि कण्टकाः ॥
पत्राणि शुङ्गा कन्दाश्च प्ररोहाश्चौद्भिदो गणः ॥ च. सू. 1/23

Charaka quoted *Oudbhida* group. Here the parts of the drug and formulation prepared from the drugs are included.

i) मूल (Root)

ii) त्वक् (Bark)

iii) सार (Heart word/sap)

iv) निर्यास (Exudate/Gum)

v) नाल (Tube)

vi) स्वरस (Fresh juice)

vii) पल्लव (Tender leaves)

viii) क्षारा (Alkaline preparation)

ix) क्षीर (Latex)

x) फल (Fruit)

xi) पुष्प (Flower)

xii) भस्म (Ash)

xiii) तैल (Oil)

xiv) कण्टक (Thorns, prickles/spine)

xv) पत्र (Leaves)

xvi) शुङ्ग (Terminal buds)

xvii) कन्द (Tubers)

xviii) प्ररोह (Arial roots/climbing stems)

Jangama

जङ्गमाः खल्वपि चतुर्विधाः-जरायुजाण्डजस्वेदजोद्भिजाः । सु. सू. 1/30

Jangama is divided into 4 types

- *Jarayuja* • *Andaja*
- *Swedaja* • *Udbhija*

Jarayuja

तत्र पशुपक्षिमनुष्यव्यालादयो जरायुजाः । सु. सू. 1/50

जरायुजादिषु पूर्वोक्त संस्वेदजादिक्रमत्यागो योनिसंकरं बोधयतिः तेन पक्षितषु बलाका जरायुजा अण्डजा चेति, सर्पजातिषु अहिपताका जरायुजा, संस्वेदजेष्वापि काश्चित् पिप्पीलिका अण्डजा उद्भिजाश्च । व्यालादय इति व्याला हिंस्त्रपशुव्याघ्रादयः अन्ये तु पशुग्रहणादेव हिंस्त्र पशुनामपि ग्रहणमिति व्यालशब्देन सर्पविशेषमाहुः । सु. सू. 1/30 (डल्हण)

Animals which take birth by Placenta (through *Yoni*).

E.g. *Pandu* (Other animals), *Manushya* (Human being), *Vyala* (Tiger).

Andaja

खगसर्पसरीसृपप्रभृतयोऽण्डजाः । सु. सू. 1/30

खगसर्पेत्यादि खगाः पक्षिणः सर्पामन्दगामिनोऽजगरप्रभृतयः, सरीसृपाः शीघ्रगामिनः कृष्ण सर्पादयः मीनमकरादयो वा; प्रभृतिग्रहणात् कूर्मनक्रादीनां ग्रहणं, केचित् प्रभृतिशब्दमपठित्वा लुप्तनिर्दिष्टनादिशब्देनकूर्मादीन् गृह्णन्ति । सु. सू. 1/30 (डल्हण)

One which have their birth through eggs called *Andaja Dravya.*

E.g. *Khaga* (Birds), *Sarpa* (slow moving snakes), *Sarisrapa* (Snakes which are moving fast like king cobra), *Kurma* (Tortoise), *Nakra* (Crocodile).

Swedaja

कृमिकीटपिपीलिकाप्रभृतयः स्वेदजाः । सु. सू. 1/30

कृमिकीटेत्यादि कृमयः कोष्ठपुरीषादिबाष्पसंभवाः कीटावृश्चिकषड्बिन्दु प्रभृतयः पिपीलिका-श्चिटिकाः, प्रभृतिग्रहणादेवं विधा अन्येऽपि दृश्यन्ते । सु. सू. 1/30 (डल्हण)

The creatures which have their birth in the dirty water.

E.g. *Krimi* (Worms) *Koshta Krimi*
Purishaja Krimi
Pipilika-Ants
Vrashchika-Scorpion

Udbhija

इन्द्रगोपमण्डूकप्रभृतय उद्भिजाः । सु. सू. 1/30

इन्द्रगोपइत्यादि इन्द्रगोपाः प्रावृट्कालजा अतिरिक्तकृमयः इन्द्रवधू इति लोके प्रभृति गृहणादीदृशा अन्येऽपि । सु. सू. 1 (डल्हण)

The smaller creatures and animals lie below the surface of the earth and when the season comes, they will come out of the earth, but basically, they are *Andaja*

E.g. *Indragopa, Manduka* (Frog)

Jangama Gana

जङ्गमेभ्यश्चर्मनखरोमरुधिरादयः ॥ सु. सू. 1/31

मधूनि गोरसाः पित्तं वसा मज्जाऽसृगामिषम् । विण्मूत्रचर्मरेतोस्थिस्नायुशृङ्गनखाः खुराः ।
जङ्गमेभ्यः प्रयुज्यन्ते केशा लोमानि रोचनाः ॥ च. सू. 1/68-69

Both Caraka and *Sushruta* enumerated different sources and products of animals.

1. *Madhu*-Honey
2. *Gorasa*-Milk & Milk products
3. *Pitta*-Bile
4. *Vasa*-Muscle fat
5. *Majja*-Bone marrow
6. *Rudhira*-Blood
7. *Vit*-Faeces
8. *Mutra*-Urine
9. *Carma*-Skin
10. *Retas*-Semen
11. *Asthi*-Bone
12. *Snayu*-Ligaments
13. *Shringa*-Horns
14. *Nakha*-Nails
15. *Khura*-Hoof
16. *Kesha*-Hair
17. *Loma / Roma* -Body hair etc.

Parthiva

सुवर्ण समलाः पञ्चलोहाः ससिकताः सुधा । मनःशिलाले मणयो लवणं गैरिकाञ्जने ॥

च. सू. 1/70

भौममौषधमुद्दिष्टम्...................... ॥ पञ्चलोहा इति ताम्ररजतत्रपुशीशकृष्णलोहानां ग्रहणम् ।
समला इति मलशब्देन शिलाजतूनि लोहमलरूपाणि गृह्यन्ते । चक्रपाणि

The substances which are found underground are called *Pārthiva Dravya.* Commonly seen substances like ores, metals, and salts are included under *Pārthiva Dravyas.*

In *Caraka Samhita Suvarna, Shilajatu, Panchaloha* (*Tamra, Rajata, Trapu, Shita, Krishnaaloha*), *Sikata* (Sand), *Sudha, Manashila, Lavana* (Salt), *Gairika* etc.

III. Classification of *Dravya* acc to *Prayoga*

Depending on the usage of the *Dravya,* it may by classified into two types.

यवागू साधनद्रव्यं तावद् द्विविधं वीर्य प्रधानमौषधद्रव्यं रसप्रधानमाहारद्रव्यञ्च ।

चक्रपाणि-च. सू. 2/17

In the chapter of *Apamarga Tanduliya* of *Caraka Samhita, Acharya Cakrapani* explained differences between *Oushadha Dravya* and *Ahara Dravyas.* In his opinion the *Ahara Dravya* (food) have mainly dominant *Rasa,* hence they nourish the *Dhatu* (tissue) and gives strength. E.g. *Godhuma, Shali.*

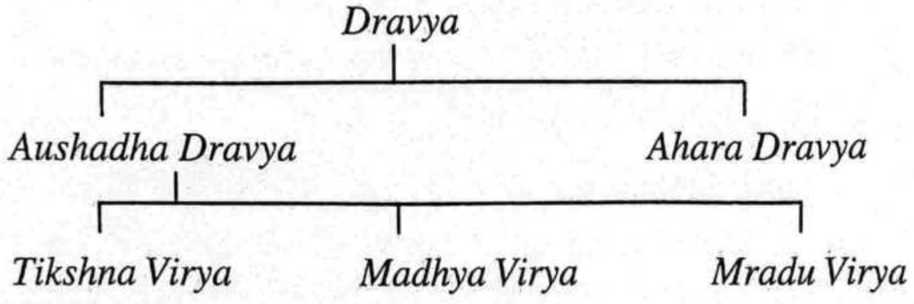
Oushadha Dravyas will have dominant *Virya* and they will show specific pharmacological actions for which purpose it is administered and which will bring normalcy in the *Sharira* (body). E.g. *Pippali, Shunthi.*

यद् द्रव्यमुपयुक्तं देहे रसधातु तद् द्वारा रक्तादि धातुश्च प्राधान्येन पुष्याति, न त्वौषधद्रव्यवत् प्रधानतया देहे शीतोष्णादीन् वीर्यसंज्ञकान् गुणाञ्जनयति तद् रसप्रधानं, तदाहारद्रव्यम्, यव गोधूमादि ।

चक्रपाणि-च. सू. 2

तत्राप्यौषधद्रव्यं त्रिविधं वीर्य भेदात् तीक्ष्ण वीर्यं यथा शुण्ठ्यादि, मध्यवीर्य बिल्वाग्निमन्थादि, मृदुवीर्यञ्चामलकादि । सु. सू. 2 (च. द.)

Depending on the presence of *Shita, Ushna, Ruksha* etc, *Virya Oushadha Dravya* is divided into 3 types viz. *Tikshna Virya, Madhya Virya* and *Mradu Virya.*



Cakrapani Datta has given certain examples for these 3 kinds of *Dravyas.*

Tikshna Virya Dravya- E.g. *Shunthi* (Zingiber officinale)

Madhya Virya Dravyas- E.g. *Bilva* (Aegle marmelos), *Agnimantha* (Premna integrifolia)

Mradu Virya- Eg.Amalaki (Emblica officinalis)

IV. Classification of *Dravya* acc to *Prabhava*

किञ्चिद्दोषप्रशमनं किंचिद्धातु प्रदूषणम् । स्वस्थवृत्तौ मतं किञ्चित्रिविधं द्रव्यमुच्यते ॥

च. सू. 1/67

Acc. to *Prabhava, Dravyas* are divided into 3 types viz. *Dosha Prashamana, Dhatu Pradushana* and *Swastha Hita Dravya.*

शमनं कोपनं स्वस्थहितं द्रव्यमिति त्रिधा । अ. हृ. सू. 1/16

Dravya is of 3 types, viz.

- *Shamana* (Subsides *Dosha*)
- *Kopana* (Aggravates *Dosha*)
- *Swasthahita* (Maintains normalcy)

1. Dosha Prashamana Dravya

किंचिदिति न सर्वम् । दोषस्य दोषयोर्दोषाणां वा प्रशमनं दोष प्रशमनम् । दोषग्रहणेन दुष्टा रसादयोऽपि ग्रान्ते । तेन द्रव्यमहिम्ना यद्घोषाणां दुष्टानां रसादीनां धातूनां वा शमकमामलकदुरालभादि गृान्ते । आमलकं हि शिवत्वात्रिदोषहरं; दुरालभा चापि वातपित्तश्लेष्महरी । यद्यपि चामलकस्य "हन्ति वातं तदाम्लत्वात्" इत्यादिना गुण द्वारा त्रिदोषहरत्वमुच्यते, तथाऽपि तत्प्रभावबृंहितमेव बोद्धव्यम् । यतस्तत्राम्लत्वादिना पित्तादि कोपोऽपि युज्यते, स त्वामलकप्रभावन्न भवति ।

चक्रपाणि-च. सू. 1/67

Dravyās which pacify vitiated *Dosha* and vitiated *Rasa, Raktadi Dhatus* are called *Dosha Prashamana Dravya.* E.g. *Amalaki* is *Tridoshahara, Duralabha* is *Vatapitta* and *Kaphahara* (*Tridoshahara*).

2. Dhatu Pradushana Dravya

धातुप्रदूषणमिति वातादीनां समत्वेन शरीरधारणात्मकानां तथा रसादीनां च दूषणं किञ्चित्, यथा-यवक मन्दक विषादि । चक्रपाणि-च. सू. 1/67

Because of their nature, some *Dravyas* vitiate. *Prakrata Dosha* and *Rasadi Dhatus.*

E.g. *Yavaka & Mandaka Visha*

3. Swastha Hita Dravya

सुष्ठु अवतिष्ठते नीरोगत्वेनेति स्वस्थः; तस्य वृत्तिः स्वस्थरूपतया अनुवर्तनं, तत्र स्वस्थवृत्तौ मतमभिमतं पूजितमिति यावत् । अत्रोच्यतेस्वस्थवृत्तिमतं रक्तशाल्यादि दोषप्रशमनमपि भवति, परं तत् प्रायः स्वस्थवृजिहित्वात् स्वस्थवृत्तिमतत्वेन गृाते । चक्रपाणि-च. सू. 1/67

Dravya which are very useful for the *Swastha* (Healthy person) that which maintains *Swasthya* (Healthy condition) are Swasthahita Dravya. Sometimes, *Swasthahita Dravyas* may also do *Doshaprashamana.*

E.g. *Rakta Shali, Godhuma* etc.

1. a) Vata Samshamana Dravya

1. रुक्षः शीतो लघुः सूक्षाश्चलोऽथ विशदः खरः ।
विपरीतगुणैर्द्रव्यैर्मारुतः संप्रशाम्यति ॥ च. सू. 1/39

The *Dravya* having opposite qualities to *Vata dosha* like *Snigdha, Ushna, Guru, Sthula, Picchila* etc are considered as *Vata Samshamana Dravya.*

2. तत्र उष्ण स्निग्धौ वातघ्नौ । सु. सू. 41/11

3. तत्र मधुराम्ल लवणा वातघ्नाः । सु. सू. 42/4

4. तत्र भद्रदारु कुष्ठहरिद्रावरुणमेषशृङ्गीबलातिबलार्तगलाकच्छुराशल्लकी कुबेराक्षि वीरतरु

सहचराग्निमन्थवत्सादन्येरण्डाश्मभेदकालकोर्कशतावरी पुनर्नवा वसुक वशिर काञ्चनक भार्गीकार्पासीवृश्चिकालीपत्तूरबदरयवकोल कुलत्थ प्रभृतीनि विदारिगंधादिश्च द्वे चाद्ये पञ्चमूल्यौ समासेन वातसंशमनो वर्गः ॥ सु. सू. 39/7

Vatahara Guna, Rasa, Vipaka & Virya	*Dravya*
Guna - Snigdha, Ushna, *Rasa - Madhura, Amla & Lavana* *Vipaka - Madhura Vipaka* *Virya - Ushna*	*Bhadra Daru, Kushtha, Haridra, Varuna, Meshashrangi, Bala, Atibala, Artagala (Kakubha), Kacchura, Shallaki,, Kuberaksha,, Virataru, Sahachara, Agnimantha, Vatsadani (Gudūchi), Eranda, Pashana abheda, Alarka, Arka, Shaatavari, Punarnava, Vasuka, Vashira (Apamarga), Kancanaka (Dhattura), Bharangi, Vanakarpasa, Vrashcikali, Pattura (Kucandana), Badara, Yava, Kola, Kulattha, Vidarigandhadi Dravya, Brahatpanchamula* and *Laghu Panchamula.*

1. b) Pitta Samshamana

1. सस्नेहमुष्णं तीक्ष्णं च द्रवमाम्लं सरं कटु । विपरीतगुणैः पित्तं द्रव्यैराशु प्रशाम्यति ॥

च. सू. 1/60

The *Dravya* having opposite qualities to *Pitta dosha* like *Ruksha, Shita, Mradu, Sandra, Sthira Guna and Madhura, Tikta, Kashaya Rasa is considered as Pitta Samshamana Dravya.*

2. शीत मृदु पिच्छिलाः पित्तघ्नाः । सु. सू. 41/11

3. मधुरतिक्तकषायाः पित्तघ्नाः । सु. सू. 42/4

4.चन्दनकुचन्दन ह्रीबेरोशीर मञ्जिष्ठापयस्यविदारीशतावरीगुन्द्राशैवालकह्लार कुमुदोत्पलकन्द (द)लीदूर्वामूर्वाप्रभृतीनि काकोल्यादिः सारिवादिरञ्जनादिरुत्पलादिर्न्यग्रोधादिस्तृणपञ्चमूलमिति समासेन पित्तसंशमनो वर्गः ॥ सु. सू. 39/8

Pittahara Guna, Rasa, Vipaka & Virya	*Dravya*
Guna - Shita, Mradu, Picchila *Rasa - Madhura, Tikta, Kashaya* *Vipaka - Madhura* *Virya - Shita*	*Candana, Kucandana (Rakta Candana), Hribera, Ushira, Manjishtha, Payasya (Kshira Kakoli), Vidari,Shatavari, Gundra, Shaivala, Kalhara (Raktolpala), Kumuda, Utpala, Kandali, Durva, Murva, Kakolyadi Gana, Sarivadi, Anjanadi, Utpaladi, Nyagrodhadi & Trinapanchamula*

1. c) Kapha Samshamana

1. गुरुशीतमृदुस्निग्धमधुरस्थिरपिच्छिलाः । श्लेष्मणः प्रशमं यान्ति विपरीतगुणैर्गुणाः ॥

च. सू. 1/61

The *Dravya* having opposite qualities to *Kapha dosha* like *Laghu, Ushna, Tikshna, Ruksha and Vishada* is considered as *Kapha Samshamana Dravya*

2. तीक्ष्णरुक्षविशदाः श्लेष्मघ्नाः । सु. सू. 41/11

3. कटुतिक्तकषायाः श्लेष्मघ्नाः । सु. सू. 42/4

4. कालेयकागुरुतिलपर्णीकुष्ठहरिद्रा शीतशिव शतपुष्पा सरलारास्नाप्रकीर्योदकीर्येङ्गुदी सुमना काकादनी लाङ्गलकीहस्तिकर्णमुञ्जातकलामज्जकप्रभृतीनि वल्लीकण्टकपञ्चमूल्यौ पिप्पल्यादिर्बृहत्यादिर्मुष्ककादिर्वचादिः सुरसादिरारग्वधादिरिति समासेन श्लेष्मसंशमनो वर्गः । सु. सू. 39/9

Kaphahara Guna, Rasa, Vipaka & Virya	*Dravya*
Guna- Tikshna, Ruksha, Vishada *Rasa - Katu, Tikta & Kashaya* *Vipaka - Katu* *Virya - Ushna (Tikshna, Ruksha, Vishada)*	*Kaleyaka* (Variety of *Candana*), *Aguru, Tilaparna, Kushtha, Haridra, Shitishiva* (*Karpura*), *Shatapushpa, Sarala, Rasna, Prakirya* (*KantakiKaranja*), *Udakirya* (*Cira Bilwa*), *Ingudi, Sumana* (*Jati*) *Kakadani, Langalaki, Hastikarna, Lamajiaka* (*Ushirabheda*), *Munjataka, Vallipanchamula, Kantaki Panchamula, Pippalyadi, Brahatyadi, Mushkakadi, Vachadi, Surasadi* and *Aragwadhadi Gana Dravya*

2. a) Vata Kopana

Dravya having similar qualities to that of *Vata* like *Ruksha, Laghu & Shita is considered as Vata Kopana Dravya*

तत्र......कटुकषायतिक्तरुक्षलघुशीतवीर्यशुष्कशाकवल्लूरवरकोद्दालककोरदूषश्यामाक नीवारमुद्गमसूराढकीहरेणुकलायनिष्पावानशनविषमाशनाध्यशनवातमूत्रपुरीषशुक्रच्छर्दि क्षवथूद्गारबाष्पवेगविघातादिभिर्विशषैर्वायुः प्रकोपमापद्यते । सु. सू. 21/19

Vata Kopaka Guna, Rasa, Vipaka & Virya	*Dravya*
Guna - Ruksha, Laghu,Shita *Rasa - Katu, Tikta, Kashaya* *Vipaka - Katu Virya - Shita*	*Shushka Shaka, Vallura* (*Shuushka Mamsa*), *Varaka, Uddalaka,* (*Aranya Kodrava*), *Koradusha, Shyamaka, Nivara, Mudga, Masura, Adhaki, Harenu, Kaleya, Nishpava, Karira, Cirbhita, Bisha, Shaluka, Jambava, Tinduka*

2. b) Pitta Kopana

Dravya having similar qualities to that of Pitta Dosha like *Ushna, Tikshna & Laghu* is considered as *Pitta Kopana Dravya.*

कट्वम्ललवणतीक्ष्णोष्णलघुविदाहितिलतैलपिण्याककुलत्थसर्षपातसीहरितकशाकगोधा-मत्स्याजविकमांसदधितक्रकूर्चिकामस्तुसौवीरकसुराविकाराम्लफलकट्वर प्रभृतिभिः पित्तं प्रकोपमापद्यते । सु. सू. 21/21

Pitta Kopaka Guna, Rasa, Vipaka & Virya	*Dravya*
Guna - Ushna, Tikshna, Laghu *Rasa - Katu, Amla & Lavana* *Vipaka - Amla Vipaka, Katu Vipaka Virya - Ushna*	*Tila Taila, Pinyaka, Kulattha, Sarshapa, Atasi, Harita Shaka, Matsya-mamsa, Ajamamsa, Avika Mamsa, Dadhi, Takra, Kurcika, Mastu, Sauviraka, Sura, Madya Vikara, Amlaphala, Amrataka, Amlika, Pilu, Bhallatakasthi, Langali, Marica* and *Kshara Dravyas*

2. c) Kapha Kopana

Dravya having similar qualities to that of *Kapha* like *Snigdha, Guru, Picchila* and *shita* is considered as *Kapha Kopana Dravya.*

......मधुराम्ललवणशीतस्निग्धगुरुपिच्छिलाभिष्यन्दिहायनकयवकनैषधेत्कटमाषमहामाष गोधूम-तिल-पिष्ट-विकृति दधिदुग्धकृशरापायसेक्षुविकारानूपौदकमांसवसा बिसमृणालकसेरुक-शृङ्गाटक मधुर-वल्ली-फलसमशनाध्यशनप्रभृतिः श्लेष्मा प्रकोपमापद्यते । सु. सू. 21/23

Kapha Kopaka Guna, Rasa, Vipaka & Virya	*Dravya*
Guna - Snigdha, Guru, Picchila, Shita *Rasa - Madhura, Amla & Lavana Vipaka - Madhura* *Virya - Shita*	*Godhuma, Masha, Mahamasha, Tila, Dadhi, Dugdha, Krashara, Payasa, Ikshu Vikara, Anupa, Audaka Mamsa, Vasa, Bisa Mrnala, Kaseruka, Shringataka, Madhuraphala, Navadhanya, Kilata, Morata, Kurcika, Takra, Phanita, Moca, Kharjura, Bhavya, Narikela* etc.

3. Swasthahita Dravya

तद्यथा-लोहितशालयः शूकधान्यानां पथ्यतमत्वे श्रेष्ठतमा भवन्ति, मुद्गाः शमीधान्यानाम्, अन्तरिक्षमुदकानां, सैन्धवं लवणानां, जीवन्ती शाकं शाकानां राणेयं मृगमांसानां, लावः पक्षिणां, गोधा बिलेशयानां, रोहितो मत्स्यानां, गव्यं सर्पिः, गोक्षीरं क्षीराणां, तिलतैलं स्थावर जातानां स्नेहानां, वराह वसा आनूप मृगवसानां, चुलूकी वसा मत्स्य वसानां, पाकहंस वसा जलचर विहङ्गवसानां, कुक्कुट वसा विष्किरशकुनि वसानां, अजमेदः शाखाद मेदसां, श्रृङ्गवेरं कन्दानां, मृद्वीक फलानां,

शर्करेक्षुविकाराणाम् इति प्रकृत्यैव हिततमनामाहार विकाराणां प्राधान्यतो द्रव्याणि व्याख्यातानि भवन्ति ॥ च.सू. 25/38

Charaka has considered many *Dravyas* as most conducive in their own category.

Sl. No.	Category	Best *Dravya/Swasthahita*
1	*Shukadhanya*	*Lohita Shali*
2	*Shamidhanya*	*Mudga*
3	*Udaka*	*Antariksha Jala*
4	*Lavana*	*Saindhava Lavana*
5	*Shaka*	*Jivanti Shaka*
6	*Mragamamsa*	*Ena Mamsa*
7	*Pakshi Mamsa*	*Lava Mamsa*
8	*Bileshaya*	*Godha Mamsa*
9	*Matsya*	*Rohita Matsya*
10	*Sarpi*	*Gavya Sarpi*
11	*Kshira*	*Gokshira*
12	*Sthavara Thaila*	*Tila Thaila*
13	*Anupa Mragamāmsa*	*Varaha Vasa*
14	*Matsya Vasa*	*Culuki Vasa*
15	*Jala Cara*	*Paka Hamsa Vasa*
16	*Shakha Meda*	*Aja Meda*
17	*Kanda*	*Shrangavera*
18	*Phala*	*Mradwika*
19	*Ikshu Vikara*	*Sharkara*

Sushruta has enlisted *Dosha Prashamana* and *Dosha Prakopana Dravya.*

Classification of Dravyas on the Basis of Rasa

Depending on *Rasa* (Taste), *Dravyas* are divided into 6 groups namely.

1. *Madhura Skandha*
2. *Amla Skandha*
3. *Lavana Skandha*
4. *Katu Skandha*
5. *Tikta Skandha*
6. *Kashaya Skandha*

Madhura Skandha

जीवकर्षभकौ जीवन्ती वीरा तामलकी काकोली क्षीरकाकोली मुद्गपर्णी माषपर्णी शालपर्णी

पृश्निपर्ण्यशणपर्णी मधुपर्णी मेदा महामेदा कर्कटशृङ्गी शृङ्गाटिका छिन्नरुहा च्छत्राऽतिच्छत्रा श्रावणी महाश्रावणी सहदेवा विश्वदेवा शुवहला क्षीरशुवहला बलाऽतिबला विदारी क्षीरविदारी क्षुद्रसहामहासहा ऋष्यगन्धा अश्वगन्धा वृश्चीरः पुनर्नवा बृहती कण्टकारिकोरुबको मोरटः श्वदंष्ट्रा संहर्षा शतावरी शतपुष्पा मधूकपुष्पी यष्टिमधु मधूलिका मृद्वीका खर्जूरं परुषकात्मगुप्ता पुष्करबीजं कशेरुकं राजकशेरुकं राजादनं कतकं काश्मर्यं शीतपावयोदनपाकी तालखर्जूरमस्तकमिक्षुरिक्षुवालिका दर्भः कुशः काशः शालिर्गुन्द्रेत्कटकः शरमूलं राजक्षवकः ऋष्यप्रोक्ता द्वारदा भारद्वाजीवनत्रपुष्यभीरुपत्री हंसपादी काकनासिका कुलिङ्गाक्षी क्षीरवल्ली कपोलवल्ली कपोतवल्ली सोमवल्ली गोपवल्ली मधुवल्ली चेति । च. वि. 8/139

Jivaka, Rishabhaka, Jivanti, Vira, Tamalaki, Kakoli, Kshirakakoli,Mudgaparni, Mashaparni, Shalaparni, Prishniparni, Shanaparni (Aparajita), Vikankata, Meda, Mahameda, Karkatashrigi, Shringatika, Guduchi, Kokilaksha, Arunakokilaksha, Shravani, Alambusha, Sahadeva, Vishwadeva, Sharkara, Brahat shrangatika, Bala, Atibala, Vidari, Kshiravidari,Kumari (Kshudrasaha), Mahasaha, Rushyagandha (Bala Bheda), Ashwagandha, Vrshchira, Punarnava, Brhati, Kantakari, Urubaka, Murva (Morata), Gokshura, Bandaka, (Samharsha), Shatavari, Shatapushpa, Madhukapushpi, Yashtimadhu, Madhulika, Mrdwika,Kharjūra, Parushaka, Atmagupta, Pushkarabija, Kasheruka, Rajakasheruka, Rajadana, Kataka, Kashmarya, Shitapaki (Shitala), Odanapaki (Nilazinti), Talakharjura, Mastaka, Ikshu, Ikshuvalika, Darbha, Kusha, Kasha, Shali, Gundra,Itkata, Sharamula, Rajakshavaka, Rishyaprokta (Balabheda), Dwarada (Shakataru), Bharadwaji, Vanatrapushi, Abhiru (Shatavari Bheda), Hamsapadi, Kakanasi, Kulingakshi (Pitika), Kshiravalli, Kapotavalli (Sukshmaila), Kapolavalli, Somavalli, Gopavalli (Anantamūla), Madhuvalli (Yashtimadhu Bheda).

काकोल्यादिः क्षीरघृतवसामज्जशालिषष्टिकयवगोधूममाषशृङ्गाटक कसेरुकत्रपुसैर्वारुकर्कारु-कालाबुकालिन्दकतक गिलोध्यप्रियालपुष्करबीजकाश्मर्यमधूकद्राक्षाखर्जूरराजादनतालनालिकेरेक्षु-विकारबलातिबलात्मगुप्ताविदारी पयस्यागोक्षुरकक्षीरमोरटमधूलिकाकूष्माण्डप्रभृतीनि समासेन मधुरो वर्गः । सु. सू. 42/11

Kakolyadi Gana Dravya, Kshira, Ghrata, Vasa, Majja, Shali, Shashtika Shali, Yava, Godhuma, Masha, Sharngataka, Kaseruka, Trapusa, Ervaruka, Karkaru, Alabu, Kalinda, Kataka, Gilodhya, Priyala, Pushkarabija, Kashmarya, Madhuka, Draksha, Kharjura, Rajadana, Tala, Nalikshira, Ikshuvikara, Bala, Atibala, Atmagupta, Vidari, Payasya, Gokshura, Kshiramorata, Madhulika,Kushmanda.

घृतहेमगुडाक्षोडमोचचोचपरुषकम् । अभीरुवीरापनसराजादन बलात्रयम् ॥
मेदे चतस्त्रः पर्णिन्यो जीवन्ती जीवकर्षभौ । मधुकं मधूकं बिम्बी विदारी श्रावणीयुगम् ॥
क्षीरशुवहला तुगाक्षीरी क्षीरिण्यौ काश्मरी सहे । क्षीरेक्षुगोक्षुरक्षौद्रद्राक्षादिर्मधुरो गणः ॥
अ. हृ. सू. 10/22-25

Ghrata, Hema, Guda, Kshoda, Moca, Coca, Parushaka, Abhiru, Vira, Panasa, Rajadana, Baltraya (Bala, Atibala & Nagabala), Meda, Mahameda, Shaliparni, Prishniparni, Mudgaparni, Mashaparni, Jivanti, Jivaka, Rishabhaka, Madhuka,Madhuka, Bimbi, Vidari, Shravani, Mahashravana, Kshirashukla, Tugakshiri,Kshirini-Dwaya, Gambhari, Mahasaha, Kshudrasaha Kshira, Ikshu, Gokshura, Kshaudra, Draksha.

Amla Skandha

आम्राम्रातकलकुचकरमर्दवृक्षाम्लाम्लवेतसकुवलबदरदाडिममातुलुङ्गगण्डीरामलक नन्दीतकशीतकतिन्तिडीकदन्तशङ्ठैरावतककोशाम्र धन्वनानां फलानि, पत्राणि चाम्रातका-श्मन्तकचाङ्गेरीणां चतुर्विधानां चालिकानां द्वयोश्च कोलयोश्चामशुष्कयोर्द्वयोश्चैव शुष्काम्लिकयार्ग्राम्यारण्ययोः, आसवद्रव्याणि च सुरासौवीरकतुषोदक मैरेयमेढकमदिरामधु-शुक्तशीधुदधिमण्डोदश्विद्धान्याम्लादीनि च । च. सू. वि. 8/140

Amra, Amrataka, Lakuca, Karamarda, Vrkshamla, Amlavetasa, Kuvala, Badara, Dadima, Matulunga, Gandira, Amalaka, Nanditaka, Shitaka, Tintidika, Dantashata, Eravata (Naranga), Koshamra, Dhanvana, Ashmantaka,Changeri, Kola, Asava, Sura, Souvira, Tushodaka, Maireya, Medaka, Madira,Madhushukta, Sidhu, Dadhimanda, Udashwit etc.

दाडिमामलकमातुलुङ्गाम्रातककपित्थकरमर्दबदरकोलप्राचीनामलकतिन्तिडीक कोशाम्रक भव्यपारावत वेत्रफललकुचाम्लवेतसदन्तशङ्ठदधितक्रसुराशुक्तसौवीरक तुषोदक धान्याम्ल प्रभृतीनि समासेनाम्लो वर्गः । सु. सू. 42/11

Dadima, Amlaka, Matulunga, Amrataka, Kapittha, Karamarda, Badara, Kola, Prachinamalaka, Tintidika, Koshamra, Bhavyaphala (Karmaranga), Paravata, Vetraphala Lakuca, Amlavetasa, Dantashatha (Jambira), Dadhi, Takra, Sura, Shukta, Sauviraka, Tushodaka, Dhanyamla.

अम्लो धात्रीफलाम्लीकामातुलुङ्गाम्लवेतसम् । दाडिमं रजतं तक्रं चुक्रं पालेवतं दधि ।
आम्राम्रातकं भव्यं कपित्थं करमर्दकम् ॥ अ. हृ. सू. 10/25-26

Dhatriphala, Amlika, Matulunga, Amlavetasa, Dadima, Rajata, Takra, Cukra (Shukta), Palevata, Dadhi, Amra, Amrataka, Bhavya, Kapittha, Karamarda

Lavana Skandha

सैन्धव सौवर्चलकालविडपावहयानूपकूप्यवालुकैलमौलकसामुद्ररोमकौद्भिदौषर-पाटेयकपांशुजान्येवप्रकाराणि चान्यानि लवणवर्गपरिसंख्यातानि । च. वि. 8/141

Saindhava, Sauvarcala, Kala, Vida, Pakya, Anupa, Kupya, Valuka, Maulaka, Samudra, Romaka, Udbhida, Ushara, Pateyaka & Pamshujanya.

सैन्धवसौवर्चलविडपावहयरोमक सामुद्रकपविहत्रमयवक्षारोषरप्रसूतसुवर्चिका प्रभृतीनि समासेन लवणो वर्गः । सु. सू. 42/11

Saindhava, Sauvarcala, Vida, Pakya, Romaka, Samudra, Paktrima, Yavakshira, Ushara,Suvarcika.

वरं सौवर्चलं कृष्णं विडं सामुद्रमौद्भिदम् । रोमकं पांसुजं शीसं क्षराश्च लवणो गणः ॥
अ. हृ. सू. 10/27

Vara (Saindhava), Sauvarcala, Krashna, Vida, Samudra, Oudbhida, Romaka, Pamshuja, Shisa, Kshara.

Katu Skandha

पिप्पलीपिप्पलीमूलहस्तिपिप्पली चव्य चित्रक शृङ्गवेर मरिचाजमोदार्द्रकविडङ्ग कुस्तुम्बुरुपीलुतेजोवत्येलाकुष्ठ भल्लातकास्थिहिङ्गुनिर्यासकिलिममूल्क सर्षप लशुनकरञ्जशिग्रुकमधुशिग्रुकखरपुष्पभूस्तृणसुमुखसुरस कुठेरकार्लकगण्डीरकालमालकपर्णासक्षवक फणिज्झक क्षारमूत्रपित्तानीति । च. वि. 8/142

Pippali, Pippalimula, Gaja Pippali, Chavya, Chitraka, Shringavera, Maricha, Ajamoda, Ardraka, Vidanga, Dhanyaka, Pilu, Tejovati, Ela, Kushtha, Bhallatakasthi, Hinguniryasa, Devadaru (Kilima), Mulaka, Sarshapa, Lashuna, Karanja, Shigru, Kharapushpa, Bhustrana, Sumukha (Variety of *Tulasi*), *Surasa, Kutheraka, Arjaka, Gandira, Kalamala, Kshavaka, Phanijjaka, Kshara, Mutra & Pitta.*

शिग्रुमधुशिग्रुमूलकलशुनसुमुखशीतशिवकुष्ठदेवदारुहरेणुकावल्गुजफलचण्डा गुग्गुलुमुस्तलाङ्गलकीशुकनासापीलु प्रभृतीनि सालासारादिश्च प्रायशः कटुकोवर्गः । सु. सू. 42/11

Shigru, Madhushigru, Mulaka, Lashuna, Sumukha, Shitishiva (Karpura), Kushtha, Devadaru, Harenuka, Avalguja (Bakuchi), Canda, Guggulu, Musta, Langalaki (Kalikarika), Shukanasa (Shyonaka), Pilu and *Salasaradi Gana Dravya.*

कटुकोहिङ्गु मरिचकृमिजित् पञ्चकोलकम् । कुङ्गेराद्या हरितकाः पित्तं मूत्रमरुष्करम् ॥
अ. हृ. सू. 10/30-31

Hingu, Marica, Vidanga, Panchakola, Kuthera (Shigru), Haritaka, Pitta, Mutra & Bhallataka.

Tikta Skandha

चन्दननलदकृतमालनक्तमालनिम्बतुम्बुरुकुटजहरिद्रादारुहरिद्रामुस्तामूर्वाकिराततिक्तककटुकरोहिणीत्रायमाणा कारवेल्लिकाकरीरकरवीरकेबुककङ्गिल्लक-वृषमण्डूकपर्णी कर्कोटकवार्ताककर्कशकाकमाची काकोदुम्बरिकासुषव्यतिविषापटोलकुलकपाङ्गा गुडूचीवेत्राग्रवेतसविकङ्कतबकुलसोमवल्कसप्तपर्णसुमनार्कावल्गुज-वचातगरागुरुवालकोशीराणीति । च. वि. 8/143

Chandana, Nalada, Aragwadha, Karanja, Nimba, Tumburu, Kutaja, Haridra, Daruharidra, Musta, Murva, Kiratatikta, Katukarohini, Trayamana, Karavella, Karira, Karavira, Kebuka, Kathillaka, Vruna, Mandūkaparni, Karkotaka, Vartaka, Karkasha (Patola Bheda), Kakamachi, Vetragra, Vetasa, Vikankata, Bakula, Somavalka, Saptaparna, Sumana, Arka, Avalguja, Vacha, Tagara, Agaru, Balaka, Ushira etc.

आरग्वधादिर्गुडूच्यादिर्मण्डूकपर्णीवेत्रकरीरहरिद्राद्वयेन्द्रयववरुणाखादुकण्टक सप्तपर्णबृहती-द्वयशङ्खिनीद्रवन्तीत्रिवृत्कृतवेधनकर्कोटककारवेल्लवार्ताक करीरकरवीरसुमनः शङ्खपुष्प्यपामार्ग त्रायमाणाशोकरोहिणी वैजयन्तीसुवर्चला पुनर्नवावृश्चिकालीज्योतिष्मती प्रभृतीनि समासेन तिक्तो वर्गः ।

सु. सू. 42/11

Aragvadhadi Gana, Guduchyadi Gana Dravya, Mandukaparni, Vetra, Karira, Haridra, Daruharidra, Indrayava, Varuna, Gokshura, Saptaparna, Brahati, Kantakari, Shankhini, Dravanti, Trvrit, Krtavedhana, Karkota, Karavella, Vartaka, Karira, Karavira, Sumana, Shankhapushpi, Apamarga, Trayamana, Ashokarohini, Vaijayanti, Suvarchala, Punarnava, Vrashcikali, Jyotishmati.

तिक्तः पटोली त्रायन्ती वालकोशीरचन्दनम् । भूनिम्बनिम्बकटुकातगरागुरु वत्सकम् ॥
नक्तमालाद्विरजनीमुस्तमूर्वाटरुषकम् । पाङ्गापामार्गकांस्यायोगुडूचीधन्वयासकम् ॥
पञ्चमूलं महद्याध्रौ विशालाऽतिविषा वचा ॥ अ. हृ. सू. 10/28-30

Patoli, Trayanti, Balaka, Ushira, Candana, Bhunimba, Nimba, Katuka, Tagara, Agaru, Vatsaka, Karanja, Haridra, Daruharidra, Musta, Murva, Atarushaka, Pata, Apamarga, Kamsyayas, Guduchi, Dhanvayasa, Brhatpanchamula, Vyaghra (Kshudra Brhati), Indravaruni Ativisha, Vacha.

Kashaya Skandha

प्रियङ्ग्वनन्ताम्रास्थ्यम्बष्ठकीकट्वङ्गलोध्रमोचरससमङ्गाधातकीपुष्पपद्मापद्मकेशरजम्बाम्र प्लक्षवटकपीतनोदुम्बराश्वत्थ भल्लातकास्थ्यश्मन्तकशिरीषशिंशपासोमवल्कतिन्दुक प्रियालबदर-खदिर सप्तपर्णाश्वकर्ण स्यन्दनार्जुनारिमेदैलवालुक परिपेलवकदम्ब शल्लकी जिङ्गिनी-काशकशेरुकराजकशेरुकट्फलवंशपद्मकाशोकशालधवसर्जभुर्जशणखरपुष्पापुरशमीमा-चीवरकतुङ्गाजकर्णस्फूर्जकविभीतककुम्भीपुष्करबीज बिसमृणालतालखर्जूरतरुणानीति ।

च. वि. 8/144

Priyangu, Ananta, Amrasthhi, Ambashtaki, Katvanga, Lodhra, Mocarasa, Samanga, Dhataki Pushpa, Padma, Padmakeshara, Jambu, Amra, Plaksha, Vata, Kapitana, Udumbara, Ashwattha, Bhallatakasthi, Ashmantaka, Shirisha, Shimshapa, Somavalka, Tinduka, Priyala, Badara, Khadira, Saptaparna, Ashwakarna, Syandana, Arjuna, Irimeda, Elavaluka, Paripelava (Kaivarta Mustaka), Kadamba, Shallaki, Jingini, Kasha, Kasheruka, Rajakasheruka, Katphala, Vamsha, Padmaka, Ashoka, Shala, Dhava, Sarja,

Bhurja, Shana,Kharapushpa, Pura, Shami, Machika (Devadaru), Varaka, Tunga, Ajakarna, phurjaka, Vibhitaka, Kumbi, Pushkarabija, Bisa Mrnala, Tala, Kharjura,Taruna.

न्यग्रोधादि अम्बष्ठादिप्रियङ्वादिरोध्रादिस्त्रिफलाशल्लकीजम्बवाम्रबकुलतिन्दुकफलाति कतकशाकफल पाषाणभेदकवनस्पतिफलाति सालसारादिश्च प्रायशः कुरुवककोविदारक जीवन्ती चिल्लीपालाङ्क्यासुनिषण्णक प्रभृतीनि वरकादयो मुद्गादयश्च समासेन कषायो वर्गः । सु. सू. 42/11

Nyagrodhadi Varga, Ambashthadi, Priyangvadi, Rodhradi, Gana Dravyas,Triphala, Shallaki, Jambu, Amra, Bakula, Tinduka Phala, Kataka, Shakaphala,Pashanabheda, Nyagrodhadi (Vanaspati) Phala, Salasaradi Gana Dravya, Kuruvaka, Kovidara, Jivanti, Chilli, Palankya, Sunishannaka.

वर्गः कषायः पथ्याऽक्षं शिरीषः खदिरो मधु ॥
कदम्बोदुम्बरंमुक्ताप्रवालाञ्जनगैरिकम् । बालं कपित्थं खर्जूरं बिसपद्मोत्पलादि च ॥
अ. ह. सू. 10/31-32

Pathya, Aksha, Shirisha, Khadira, Madhu, Kadamba, Udumbara, Mukta, Pravala, Anjana, Gairika, Bala Kapitha, Kharjura, Bisa, Padma, Utpala etc.

Desirable to know:

I. Sushrutokta Gana Jnana

In *Sushruta Samhita* the *Dravyas* are grouped under 37 *Ganas*. Here *Gana* means, which is a group, where the number of *Dravyas* varies that, is no fixed number of *Dravyas* as in *Charakokta Varga.* The *Ganas* are named after the first drug of that *Gana* or based on morphology and useful parts.

1. Vidarigandhadi Gana

विदारिगन्धा विदारी विश्वदेवासहदेवा श्वदंष्ट्रापृथक्पर्णी शतावरी सारिवा कृष्णसारिवा जीवकर्षभकौ महासहा क्षुद्रसहा बृहत्यौ पुनर्नवैरण्डो हंसपादी वृश्चिकाल्यृषभी चेति ।

विदारिगन्धादिरियं गणः पित्तानिलापहः । शोषगुल्माङ्गमर्दोर्ध्वश्वासकासविनाशनः ॥
सु. सू. 38/4-5

1. *Vidarigandha (Desmodium gangeticum)*
2. *Vidari (Peuraria tuberosa)*
3. *Vishwadeva (Grewia hirsuita)*
4. *Sahadevi (Vernonia cinerea)*
5. *Shwadamshtra (Tribulus terrestris)*
6. *Prathakparni (Uraria picta)*

7. *Shatavari* (*Asparagus racemosus*)
8. *Sariva* (*Hemidesmus indicus*)
9. *Krishna sariva* (*Cryptolepsis buchanani*)
10. *Jivaka* (*Microstylis wallichii*)
11. *Rishabhaka* (*Microstylis mucifera*)
12. *Mahasaha* (*Teramnus labialis*)
13. *Kshudrasaha* (*Vigna trilobata*)
14. *Brahati* (*Sūkshmaphala*) (*Solanum indicum*)
15. *Brahati* (*Sthūlaphala*) (*Solanum indicum*)
16. *Punarnava* (*Boerhavia diffusa*)
17. *Eranda* (*Ricinus communis*)
18. *Hamsapadi* (*Adiantum lunulatum*)
19. *Vrischikali* (*Pergularia extensa*)
20. *Rishabhi* (*Mucuna pruriens*)

Totally 21 drugs are mentioned in this gaNa.

Doshakarma : Vatapittahara

Indications: Shosha, Gulma, Angamarda, Urdhwashwasa & Kasa.

2. *Aragwadhadi Gana*

आरग्वधमदनगोपघोण्टाकण्टकीकुटजपाठापाटलामुर्वेन्द्रयवसप्तपर्णनिम्बकुरुण्टकदासी-कुरुण्टकगुडूची चित्रकशार्ङ्गष्टाकरन्जद्वयपटोलकिराततिक्तानि सुषवि चेति । आरग्वधादिरित्येष गणः श्लेष्मविषापहः । मेहकुष्ठज्वरवमीकण्डूघ्नो व्रणशोधनः ॥ सु. सू. 38/6-7

1. *Aragwadha* (*Cassia fistula*)
2. *Madana* (*Randia dumetorum*)
3. *Gopaghonta* (*Momordica charantia*)
4. *Kantaki* (*Flacortia rhamontchi*)
5. *Kutaja* (*Holarrhena antidysenterica*)
6. *Patha* (*Cissampelos pareira*)
7. *Patala* (*Stereospermum suaveolens*)
8. *Murva* (*Marsedenia tenacissima*)
9. *Indrayava* (Seed of *Holarrhena antidysenterica*)
10. *Saptaparna* (*Alstonia scholaris*)
11. *Nimba* (*Azadirachta indica*)
12. *Kuruntaka* (*Barleria prionitis*)

13. *Dasikuruntaka* (*Barleria strigosa*)
14. *Guduchi* (*Tinospora cordifolia*)
15. *Chitraka* (*Plumbago zeylanica*)
16. *Sharngashta* (*Peristrophe bicalyculata*)/(*Physalis minima*)
17. *Karanja-Chirabilwa* (*Holoptelia integrifolia*)
18. *Kantaki Karanja* (*Caesalpinia crista*)
19. *Patola* (*Tricosanthes dioica*)
20. *Kiratatikta* (*Swertia chirata*)
21. *Sushavi* (*Momordica charantia*)

Totally 21 *dravyas* are included in this *Gana.*

Doshakarma: Kaphahara

Indications: *Visharoga, Meha, Kushtha, Jwara, Chardi, Kandu* and *Vrana Shodhanartha.*

3. *Salasaradi Gana*

सालसाराजकर्णखदिरकदरकालस्कन्धक्रमुकभुर्जमेषश्रृङ्गतिनिशचन्दनकुचन्दनशिंशपाशिरीषासनध-वार्जुनतालशाकनक्तमालपूतीकाश्वकर्ण गुरुणी कालीयकं चेति । सालसरादिरित्येष गणः कुष्ठ विनाशनः । मेहपाण्ड्वामयहरः कफमेदोविशोषणः ॥ सु. सू. 38/8-9

1. *Salasara* (Resin of *Shorea robusta*)
2. *Ajakarna* (*Vateria indica*)
3. *Khadira* (*Acacia catechu*)
4. *Kadara* (*Acacia suma*)
5. *Kalaskandha* (*Diospyros melanoxylon*)
6. *Kramuka* (*Areca catechu*)
7. *Bhurja* (*Betula utilis*)
8. *Meshshranga* (*Dolichandrone falcata*)
9. *Tinisha* (*Ougenia dalbergioides*)
10. *Chandana* (*Santalum album*)
11. *Kucandana* (*Pterocarpus santalinus*)
12. *Shimshaapa* (*Dalbergia sisso*)
13. *Shirisha* (*Albizzia labback*)
14. *Asana* (*Pterocarpus marsupium*)
15. *Dhava* (*Anogeissus latifolia*)
16. *Arjuna* (*Terminalia arjuna*)

17. *Tala* (*Borassus flabellifer*)
18. *Shaka* (*Tectona grandis*)
19. *Naktamala* (*Pongamia pinnata*)
20. *Putika* (*Holoptelia integrifolia*)
21. *AshwakarNa* (*Dipterocarpus alatus*)
22. *Aguru* (*Aquillaria agallocha*)
23. *Kaliyaka* (*Coscinium fenestratum*)

There are 23 *Dravyas* included in this *Gana.*

Doshakarma: Kapha Shamaka

Indications: *Kushtha, Meha, Pandu* and *Medoroga.*

4. *Varunadi Gana*

वरुणार्तगलशिग्रुमधुशिग्रुतर्कारीमेषश्रृङ्गीपूतीकनक्तमालमोरटाग्निमन्थसैरेयकद्वयबिम्बी वसुकवसिरचित्रकशतावरीबिल्वाजश्रृङ्गीदर्भा बृहतीद्वयं चेति । वरुणादिर्गणो ह्येष कफमेदोनिवारणः । विनिहन्तिशिरःशूलगुल्माभ्यन्तरविद्रधीन् ॥ सु. सू. 38/10-11

1. *Varuna* (*Crateava nurvala*)
2. *Artagala* (*Xanthium strumarium*)
3. *Shigru* (*Moringa oleifera*)
4. *Madhushigru* (*Moringa concanensis*)
5. *Tarkari* (*Premna mucronata*)
6. *Meshashringi* (*Dolicandrone falcata*)
7. *Putika* (*Holoptelia integrifolia*)
8. *Naktamala* (*Pongamia pinnata*)
9. *Morata* (Flower of *Alangium salvifolium*)
10. *Agnimantha* (*Premna integrifolia*)
11. *Raktapushpa saireyaka* (*Barleria cristata*)
12. *Nilapushpa saireyaka* (*Barleria strigosa*)
13. *Bimbi* (*Coccinia grandis*)
14. *Vasuka* (*Osmanthus fragrans*)
15. *Vasira* (*Achyranthes aspera*)
16. *Chitraka* (*Plumbago zeylanica*)
17. *Shatavari* (*Asparagus racemosus*)
18. *Bilva* (*Aegle marmelos*)
19. *Ajashringi* (*Pergularia extensa*)

20. *Darbha* (*Desmostachya bipinnata*)
21. *Brihati* (*Solanum indicum*)
22. *Kantakari* (*Solanum xanthocarpum*)

Totally 22 *Dravyas* are mentioned in this *Gana.*

Doshakarma: Kaphashamaka

Indications: *Shirashula, Gulma, Medoroga* and *Abhyantara Vidradhi.*

5. *Viratarvadi Varga*

वीरतरुसहचरद्वयदर्भवृक्षादनीगुन्द्रानलकुशकाशाश्मभेदकाग्निमन्थमोरटावसुकवसिरभल्लूककुरण्टि-केन्दीवरकपोतवङ्क श्वदंष्ट्रा चेति । वीरतर्वादिरित्येष गणो वातविकारनुत् । अश्मरीशर्करामूत्रकृच्छ्राघातरुजापहः ॥ सु. सू. 38/12-13

1. *Virataru* (*Dichrostachys cinerea*)
2. *Raktapushpa* (*Barleria cristata*)
3. *Nilapushpa* (*Barleria strigosa*)
4. *Darbha* (Imperata cylindrica)
5. *Vrakshadani* (*Loranthus longiflorus*)
6. *Gundra* (*Typha angustata*)
7. *Nala* (*Arundo donax*)
8. *Kusha* (*Eragrostis cynosuroides*)
9. *Kasha* (*Saccharum spontaneum*)
10. *Ashmabhedaka* (*Berginia ligulata*)
11. *Agnimantha* (*Premna integrifolia*)
12. *Morata* (Maerua arenaria)
13. *Vasuka* (*Osmanthus fragrans*)
14 *Vasira* (*Achyranthes aspera*)
15. *Bhalluka* (*Oroxylum indicum*)
16. *Kurantika* (*Barleria prioritis*)
17. *Indivara* (*Celosia cristata*)
18. *Kapotavanka* (*Bacopa monnieri*)/(*Dalbergia lancedonia*)
19. *Shwadamshtra* (*Tribulus terrestris*)

Totally 19 *Dravya* are included in this *Gana*

Doshakarma: Vatahara

Indications: *Vataroga, Ashmari, Sharkara, Mutrakrchra* and *Aghataja Ruja.*

6. *Rodhradi Gana*

लोध्रसावरलोध्रपलाशकुटन्नटाशोकफञ्जीकट्फलैलवालुकशल्लकीजिङ्गिनी कदम्बसालाः कदली चेति । राष रोध्रादिरित्युक्तो मेदःकफहरो गणः । योनिदोषहरः स्तम्भी वर्ण्यो विषविनाशनः ॥

सु. सू. 38/35

1. *Lodhra (Symplocos racemosa)*
2. *Sabaralodhra (Symplocos crataegoides)*
3. *Palasha (Butea monosperma)*
4. *Kutannata (Oroxylum indicum)*
5. *Ashoka (Saraca asoca)*
6. *Phanji (Rivea ornata)*
7. *Katphala (Myrica nagi)*
8. *Elavaluka (Prunus cerasus)*
9. *Shallaki (Boswellia serrata)*
10. *Jingini (Odina woodier)*
11. *Kadamba (Anthocephalus cadamba)*
12. *Sala (Vateria indica/Shorea robusta)*
13. *Kadali (Musa paradisica)*

Totally 13 drugs have been included in this *Gana.*

Doshakarma: Kaphahara

Indications: *Medoroga, Yonidosha, Visha.*

7. *Arkadi Gana*

अर्कालर्ककरञ्जद्वयनागदन्तीमयूरक भार्ङ्गीरास्नेन्द्रपुष्पीक्षुद्रश्वेतामहाश्वेता वृश्चिकान्यलवणा-स्तापसवृक्षश्चेति । अर्कादिको गणो ह्येष कफमेदोविषापहः । कृमिकुष्ठप्रशमनो विशेषाद्व्रणशोधनः ॥

सु. सू. 38/16-17

1. *Arka (Calotropis procera)*
2. *Alarka* (Calotropis gigantia)
3. *Vrakshakaranja (Pongamia pinnata)*
4. *Vitapakaranja (Holoptella integrifolia)*
5. *Nagadanti (Baliospermum montanum)*
6. *Mayuraka (Achyranthes aspera)*
7. *Bharangi (Clerodendron serratum)*
8. *Rasna (Pluchea lanceolata)*
9. *Indrapushpi (Gloriosa superba)*

10. *Kshudrashweta* (*Clitorea ternatea*)/*Albizia procera*
11. *Mahashweta* (White flowered *Clitorea ternatea*)/*Albizia lucida*
12. *Vrischikali* (*Pergularia extensa*)
13. *Alavana* (*Celastrus paniculatus*)
14. *Tapasa Vraksha* (*Balanites roxburghii*)

This *Gana* includes 14 *Dravyas*.

Doshakarma: Kaphanashaka

Indications: *Krimi, Kushtha, Vrana* and *Medoroga*

8. *Surasadi Gana*

सुरसाश्वेतसुरसाफणिज्झकार्जकभूस्तृणसुगन्धकसुमुखकालमालकुठेरककासमर्दक्षवकखरपुष्पाविडङ्गकटफल सुरसीनिर्गुण्डीकुलाहलोन्दुरुकर्णिकाफञ्जी प्राचीबलकाकमाच्योविषमुष्टिकश्चेति । सुरसादिर्गणो ह्येष कफहृत् कृमिसूदनः । प्रतिश्यायारुचिश्वासकासघ्नो व्रणशोधनः ॥ सु. सू. 38/18-19

1. *Surasa* (*Ocimum sanctum*)
2. *Shwetasurasa* (*Ocimum sanctum*)
3. *Phanijjaka* (*Origanum majorana*)
4. *Arjaka* (*Ocimum basilicum*)
5. *Bhustrana* (*Cymbopogon citratus*)/(*Hyptis suaveolens*)
6. *Sugandhaka* (*Leucas aspera*)
7. *Sumukha* (*Brassica juncea*)/*Ocimum* Sp.
8. *Kalamala* (*Ocimum basilicum*)
9. *Kasamarda* (*Cassia occidentalis*)
10. *Kshavaka* (*Centipeda minima*)
11. *Kharapushpa* (*Origanum majorana*)/(*Thymus serpyllum*)
12. *Vidanga* (*Embelia ribes*)
13. *Katphala* (*Myrica nagi*)
14. *Surasi* (*Limonia crenulata*)
15. *Nirgundi* (*Vitex negundo*)
16. *Kulahala* (*Spaeranthes indicus*)
17. *Undurukarnika* (*Ipomea reniformis*)
18. *Phanji* (*Clerodendron serratum*)
19. *Prachibala* (*Perstrophe bicalyculata*)
20. *Kakamachi* (*Solanum nigrum*)
21. *Vishamushti* (*Strychnos nux-vomica*)

Totally 21 *Dravyas* have been included in this *Gana*.

Dishakarma: Kaphahara

Indications: *Krimi, Pratishyaya, Aruchi, Shwasa, Kasa, Vrana*

9. Mushkakadi Gana

मुष्ककपलाशधवचित्रकमदनवृक्षकशिंशपावज्रवृक्षास्त्रिफला चेति । मुष्ककादिर्गणां ेष मेदोघ्नः शुक्रदोषहृत् । मेहार्शः पाण्डुरोगघ्नः शर्करानाशनः परः ॥ सु. सू. 38/20-21

1. *Mushkaka* (*Schrebera swieteniodes*)
2. *Palasha* (*Butea monosperma*)
3. *Dhava* (*Anogeissus latifolia*)
4. *Chitraka* (*Plumbago zeylanica*)
5. *Madana* (*Randia spinosa*)
6. *Vrkshaka* (*Holarrhena antidysenterica*)
7. *Shimshapa* (*Dalbergia sissoo*)
8. *Vajra Vrksha* (*Euphorbia nerifolia*)
9. *Haritaki* (*Terminalia chebula*)
10. *Vibhitaki* (*Terminalia belerica*)
11. *Amalaki* (*Emblica officinalis*)

Totally 11 *Dravyas* are mentioned under this *Gana*.

Doshakarma: Kaphahara

Indications: *Medoroga, Shukradosha, Meha, Arsha, Pandu* and *Shoka*.

10. Pippalyadi Gana

पिप्पलीपिप्पलीमूलचव्यचित्रकशृङ्गवेरमरिचहस्तिपिप्पलीहरेणुकैलाजमोदेन्द्रयवपाङ्गाजीरकसर्षपमहा-निम्बफलहिङ्गुभार्गीमधुरसाऽतिविषावचाविडङ्गानि कटुरोहिणी चेति । पिप्पल्यादिः कफहरः प्रतिश्यायानिलारुचीः । निहन्याद्दीपनो गुल्मशूलघ्नश्चामपाचनः ॥ सु. सू. 38/22-23

1. *Pippali* (*Piper longum*)
2. *Pippalimula* (Root of *Piper longum*)
3. *Chavya* (*Piper chaba*)
4. *Chitraka* (*Plumbago zeylanica*)
5. *Shrangavera* (*Zingiber officinale*)
6. *Maricha* (*Piper nigrum*)
7. *Hastipippali* (*Scindapsus officinalis*)/(*Piper chaba*)
8. *Harenuka* (*Amomum subulatum*)

9. *Ela* (*Elattaria cardamomum*)
10. *Ajamoda* (*Apium graeolens*)
11. *Indrayava* (Seed of *Holarrhena antidysenterica*)
12. *Patha* (*Cissampelos pariera*)
13. *Jiraka* (*Cuminum cyminum*)
14. *Sarshapa* (*Brassica campestris*)
15. *Mahanimbaphala* (Fruit of *Melia azadirachta*)
16. *Hingu* (*Ferula narthex*)
17. *Bharangi* (*Clerodendron serratum*)
18. *Madhurasa* (*Marsedenia tenacissima*)
19. *Ativisha* (*Aconitum heterophyllum*)
20. *Vacha* (*Acorus calamus*)
21. *Vidanga* (*Embelia ribes*)
22. *Katurohini* (*Picrorrhiza kurroa*)

Totally 22 drugs are included in this *Gana.*

Doshakarma: Kaphahara and *Vatahara*

Indications: *Pratishyaya, Aruchi, Agnimandya, Gulma, Shula*

11. *Eladi Gana*

एलातगरकुष्ठमांसीध्यामकत्वक्पत्रनागपुष्पप्रियङ्गुहरेणुकाव्याघ्रनखशुक्तिचण्डास्थौणेयकश्रीवेष्टकचोचचोरकवालुकगुग्गुलुसर्जरसतुरुष्ककुन्दुरुकागरुस्पृक्कोशीर भद्रदारुकुङ्कुमानि पुन्नागकेशरं चेति । एलादिको वातकफौ निहन्याद्विषमेव च । वर्णप्रसादनः कण्डूपिडकाकोठनाशनः ॥

सु. सू. 38/24-25

1. *Ela* (*Elattaria cardamomum*)
2. *Tagara* (*Valeriana wallaichi*)
3. *Kushtha* (*Saussurea lappa*)
4. *Mamsi* (*Nardostachys jatamansi*)
5. *Dhyamaka* (*Cimbopogan citratus*)
6. *Twak* (*Cinnamomum zeylanica*)
7. *Patra* (*Cinnamomum tamala*)
8. *Nagapushpa* (*Mesua ferrea*)
9. *Priyangu* (*Callicarpa macrophylla*)
10. *Harenuka* (*Amomum subulatum*)
11. *Vyaghranakha* (*Capparis sepiaria*)

12. *Shukti* (*Vyaghranakha Bheda*) (*Capparis* Sp.)
13. *Chanda* (*Angelica archangelica*)
14. *Sthauneyaka* (*Taxus baccata*)
15. *Shriveshtaka* (*Pinus roxburghi*)
16. *Chocha* (*Cinnamomum zeylanica*)
17. *Choraka* (*Angelica glauca*)
18. *Valuka* (*Prunus cerasus*)
19. *Guggulu* (*Commiphora mukul*)
20. *Sarjarasa* (*Vateria indica*)
21. *Turushka* (*Liquidamber orientalis*)
22. *Kunduru* (*Niryāsa* of *Boswelia serrata*)
23. *Sprakka* (*Delphinium zalil*)
24. *Ushira* (*Vetiveria zizanoides*)
25. *Bhadradaru* (*Cedrus deodara*)
26. *Kumkuma* (*Crocos sativus*)
27. *Punnaga* (*Calophyllum inophyllum*)
28. *Keshara* (*Mimusops elengi*)

Totally 28 Drugs are mentioned

Doshakarma: Vatakaphahara

Indications: *Visha, Kandu, Pidaka, Kota* and as *Vrana-prasadaka.*

12. Vachadi Gana

वचामुस्तातिविषाभयाभद्रदारुणि नागकेशरं चेति । सु. सू. 38/26

1. *Vacha* (*Acorus calamus*)
2. *Musta* (*Cyperus rotundus*)
3. *Ativisha* (*Aconitum heterophyllum*)
4. *Abhaya* (*Terminalia chebula*)
5. *Bhadradaru* (*Cedrus deodara*)
6. *Nagakeshara* (*Mesua ferrea*)

Doshakarma: Dosha Pachaka

Indications: *Stanya Dushti, Amatisara*

13. Haridradi Gana

हरिद्रादारुहरिद्राकलशीकुटजबीजानि मधुकं चेति ॥ शतौ वचाहरिद्रादी गणौ स्तन्यविशोधनौ । आमातिसारशमनौ विशेषाद्दोषपाचनौ ॥ सु. सू. 38/27-28

1. *Haridra* (*Curcuma longa*)
2. *Daruharidra* (*Berberis aristata*)
3. *Kalashi* (*Uraria picta*)
4. *Kutajabija* (Seed of *Holarrhena antidysenterica*)
5. *Madhuka* (Glycyrrhiza glabra)

Both *Vachadi* and *Haridradi Gana* have similar properties.

Doshakarma: Dosha Pachaka

Indications: *Stanya Dushti, Amatisara*

14. Shyamadi Gana

श्यामामहाश्यामात्रिवृद्धन्तीशङ्खिनीतिल्वककम्पिल्लकरम्यकक्रमुकपुत्रश्रेणीगवाक्षीराजवृक्ष-करञ्जद्वयगुडूचीसप्तलाच्छगलान्त्रीसुधाः सुवर्णक्षीरी चेति । उक्तः श्यामादिरित्येष गणो गुल्मविषापहः । आनाहोदर विड्भेदी तथोदावर्तनाशनः ॥ सु. सू. 38/29-30

1. *Shyama* (*Ipomoea turpethum*)
2. *Mahashyama* (*Ipomoea petaloidea*)
3. *Trvrit* (*Operculina turpethum*)
4. *Danti* (*Baliospermum montanum*)
5. *Shankhini* (*Euphorbia dracunculoides*)
6. *Tilvaka* (*Vibrum nervosum*)
7. *Kampillaka* (*Mallotus philippinensis*)
8. *Ramyaka* (*Melia azadirachta*)
9. *Kramuka* (Fruit of *Areca catechu*)
10. *Putrashreni* (*Croton oblongifolius*)
11. *Gavakshi* (*Citrulus colocynthis*)
12. *Rajavriksha* (*Cassia fistula*)
13. *Vraksha Karanja* (*Pongamia pinnata*)
14. *Vitapakaranja* (*Holoptelia integrifolia*)
15. *Guduchi* (*Tinospora cordifolia*)
16. *Saptala* (*Euphorbia pilosa*)
17. *Chagalantri* (*Argeria nurvosa*)
18. *Sudha* (*Euphorbia nerifolia*)
19. *Suvarnakshiri* (*Euphorbia thomsoniana*)

Totally 19 drugs have been mentioned in this *Varga*

Doshakarma :

Indications: *Gulma, Visha, Anaha, Udara, Udavarta*

15. Brahatyadi Gana

बृहतीकण्टकारिकाकुटजफलपाठामधुकं चेति । पाचनीयो बृहत्यादिर्गणः पित्तानिलापहः । कफारोचकहृद्रोगमूत्रकृच्छ्ररुजापहः ॥ सु. सू. 38/31-32

1. *Brhati* (*Solanum indicum*)
2. *Kantakari* (*Solanum xanthocarpum*)
3. *Kutaja Phala* (Fruit of *Holarrhena antidysenterica*)
4. *Patha* (*Cissampelos pareira*)
5. *Madhuka* (*Glycyrrhiza glabra*)

Number of drugs mentioned in this *Gana* are 5

Doshakarma: PittaVatahara

Indications: *Aruchi, Hridroga, Mutrakrachra, Ruja.*

16. Patoladi Gana

पटोलचन्दनकुचन्दनमूर्वागुडूचीपाठाः कटुरोहिणी चेति । पटोलादिर्गणः पित्तकफारोचक-नाशनः। ज्वरोपशमनो व्रण्यश्छर्दिकण्डूविषापहः ॥ सु. सू. 38/33-34

1. *Patola* (*Tricosanthes dioica*)
2. *Chandana* (*Santalum album*)
3. *Kuchandana* (*Pterocorpus santalinus*)
4. *Murva* (*Marsedenia tenacissima*)
5. *Guduchi* (*Tinospora cordifolia*)
6. *Patha* (*Cissampelos pareira*)
7. *Katurohini* (*Picrorrhiza kurroa*)

Total drugs are 7 in this *Gana.*

Dosha Karma: Pittakaphahara

Indications: *Arochaka, Jwara, Vrana, Chardi, Kandu* and *Visha.*

17. Kakolyadi Gana

काकोलीक्षीरकाकोलीजीवकर्षभकमुद्गपर्णीमाषपर्णीमेदामहामेदाच्छिन्नरुहाकर्कटशृङ्गीतुगा-क्षीरीपद्मकप्रपौण्डरीकर्धिवृद्धिमृद्वीकाजीवन्त्यो मधुकं चेति । काकोल्यादिरियं पित्तशोणितानिल-नाशनः। जीवनो बृंहणो वृष्यः स्तन्यश्लेष्मकरस्तथा ॥ सु. सू. 38/35-36

1. *Kakoli* (*Lillium polyphyllum*)
2. *Kshirakakoli* (*Lillium* Sp.)

3. *Jivaka* (*Microstylis wallichii*)
4. *Rishabhaka* (*Microstylis mucifera*)
5. *Mudgaparni* (*Phaseolus trilobus*)
6. *Mashaparni* (*Teramnus labialis*)
7. *Meda* (*Polygonatum verticillate*)
8. *Mahameda* (*Polygonatum* Sp.)
9. *Chinnaruha* (*Tinospora cordifolia*)
10. *Karkatashringi* (*Pistacia integerrima*)
11. *Tugakshiri* (*Bambusa arundinacia*)
12. *Padmaka* (*Prunus cerasoides*)
13. *Prapoundarika* (*Nelumbo nucifera*)
14. *Ruddhi* (*Habenaria* intermedia)
15. *Vraddhi* (*Habenaria edgeworthi*)
16. *Mradwika* (*Vitis vinifera*)
17. *Jivanti* (*Leptadenia reticulata*)
18. *Madhuka* (*Glycyrrhiza glabra*)

Totally 18 drugs are included in this *Gana.*

Doshakarma: PittaVatashamaka

Indications: *Klaibya, Stanyakshaya, Krisha*

18. *Ushakadi Gana*

ऊषक सैन्धवशिलाजतुकासीसद्वयहिङ्गूनि तुत्थकं चेति ।
ऊषकादिः कफं हन्ति गणो मेदोविशोषणः । अश्मरीशर्करामूत्रकृच्छ्रगुल्मव्रणाशनः ॥

सु. सू. 38/37-38

1. *Ushaka* (*Kshira Mrattika*)/ (*Dorema ammoniacum*)
2. *Saindhava* (Rock salt)
3. *Shilajatu* (Bitumen)
4. *Kasisa* (Ferrous sulphate)
5. *Pushpakasisa* (Ferrous sulphate)
6. *Hingū* (*Ferula narthex*)

Totally 6 *Dravyas* are mentioned in this *Gana.*

Doshakarma: Kaphahara

Indications: *Medoroga, Ashmari, Sharkara, Mutrakricchra, Gulma* and *Vrana.*

19. Sarivadi Gana

सारिवामधुकचन्दनकुचन्दनपद्मककाश्मरीफलमधूकपुष्पाण्युशीरं चेति । सारिवादि पिपासघ्नी रक्तपित्तहरो गणः । पित्तज्वरप्रशमनो विशेषाद्दाहनाशनः ॥ सु. सु. 38/39-40

1. *Sariva* (*Hemidesmus indicus*)
2. *Madhuka* (*Glycyrrhiza glabra*)
3. *Kuchandana* (*Pterocarpus santalinus*)
4. *Padmaka* (*Prunus cerasoides*)
5. *Kashmariphala* (Fruit of *Gmelina arboroea*)
6. *Madhukapushpa* (Flower of *Madhuca indica*)
7. *Ushira* (*Vetiveria zizanoides*)

Totally 7 drugs are mentioned in this *Gana*.

Doshakarma: Pittahara

Indications: *Pipasa, Raktapitta, Pittajwara* and *Daha*

20. Anjanadi Gana

अञ्जनरसाञ्जननागपुष्पप्रियङ्गुनीलोत्पलनलदनलिनकेशराणि मधुकं चेति । अञ्जनादिगणोह्यिेषरक्तपित्तनिबर्हणः । विषोपशमनो दाहं निहन्त्याभ्यन्तरं भृशम् ॥ सु. सू. 38/41-42

1. *Anjana* (*Sauviranjana*) (Collyrium)/ *Hardwickia binata*
2. *Rasanjana* (Coryllium) (*Berberis aristata*)
3. *Nagapushpa* (*Mesua ferrea*)
4. *Priyangu* (*Calicarpa macrophylla*)
5. *Nilotpala* (*Nymphaea stellata*)
6. *Nalada* (*Nardostachys jatamansi*)
7. *Nalinakeshara* (*Nelumbo nucifera*)
8. *Madhuka* (*Glycyrrhiza glabra*)

Totally 8 *Dravyas* are mentioned in this *Gana*.

Doshakarma : Pittahara

Indications: *Visha, Daha*

21. Parushakadi Gana

परुषकद्राक्षाकट्फलदाडिमराजादनकतकफलशाकफलानित्रिफला चेति । परुषकादिरित्येष गणोऽनिलविनाशनः । मूत्रदोषहरो हृद्यः पिपासाघ्नो रुचिप्रदः ॥ सु. सू. 38/43-44

1. *Parushaka* (*Grewia asiatica*)
2. *Draksha* (*Vitis vinifera*)

3. *Katphala* (*Myrica nagi*)
4. *Dadima* (*Punica granatum*)
5. *Rajadana* (*Manilkara hexandra*)
6. *Katakaphala* (Fruit of *Strychnos potatorum*)
7. *Shakaphala* (Fruit of *Tectona grandis*)
8. *Amalaki* (*Emblica officinalis*)
9. *Haritaki* (*Terminalia chebula*)
10. *Vibhitaki* (*Terminalia belerica*)

Total *Dravyas* in this *Gana* are 10.

Doshakarma: Vatanashaka

Indications: *Mutradosha, Hradroga, Pipasa* and *Aruchi.*

23. Priyangvadi Gana

प्रियङ्गुसमङ्गा धातकीपुन्नागनागपुष्पचन्दनकुचन्दन मोचरसरसाञ्जन कुम्भीक स्रोतोंजन-पद्मकेसरयोजनवल्ल्यो दीर्घमूला चेति । सु. सू. 38/46

1. *Priyangu* (*Calicarpa macrophylla*)
2. *Samanga* (*Mimosa pudica*)
3. *Dhataki* (*Woodfordia floribunda*)
4. *Punnaga* (*Calophyllum inophyllum*)
5. *Nagpusha* (*Mesua ferrea*)
6. *Chandana* (*Santalam album*)
7. *Kuchandana* (*Pterocarcus santalinus*)
8. *Mocharasa* (Exudate of *Salmalia malabaricum*)
9. *Rasanjana* (Collyrium) (*Berberis aristata*)
10. *Kumbhika* (*Careya arborea*)
11. *Srotonjana* (Collyrium)
12. *Padmakeshara* (*Nelumbo nucifera*)
13. *Yojanavalli* (*Rubia cordifolia*)
14. *Dirghamula* (*Alhagi camelorum*)

Totally 14 drugs are mentioned in this *Gana*

Doshakarma: Pittahara

Indications: *Pakwatisara, Bhagna* and *Vrana.*

24. Ambashthadi Gana

अम्बष्ठाधातकीकुसुमसमङ्गाकट्वङ्गमधुकबिल्वपेशिकासावररोध्रपलाश नन्दीवृक्षाः पद्मकेशराणि चेति । गणौ प्रियङ्ग्वम्बष्ठादी पक्वातीसारनाशनौ । सन्धानीयौ हितौ पित्ते व्रणानां च रोपणौ ॥

सु. सू. 38/46-47

1. *Ambashtha* (*Cissampelos pareira*)
2. *Dhataki* (*Woodfordia floribunda* flowers)
3. *Samanga* (*Mimosa pudica*)
4. *Katvanga* (*Ailanthes excelsa*)
5. *Madhuka* (*Glycyrrhiza glabra*)
6. *Bilva* (*Aegle marmelos*)
7. *Sabara lodhra* (*Symplocos crategoides*)
8. *Palasha* (*Butea monosperma*)
9. *Nandi Vraksha* (*Ficus altisima*)
10. *Padmakeshara* (*Prunus cerasoides*)

Totally 10 drugs are mentioned in this *Gana*. Both *Priyangvadi* and *Ambashthadi Gana Dravyas* are having same properties.

Doshakarma: Pittahara

Indications: *Pakwatisara*, *Bhagna* and *Vrana*.

25. Nyagrodhadi Gana

न्यग्रोधोदुम्बराश्वत्थप्लक्षमधुककपीतनककुभाम्रकोशाम्रचोरकपत्रजम्बुद्वयप्रियालमधूकरोहिणी-वञ्जुलकदम्बबदरीतिन्दुकीसल्लकीरोध्रसाबररोध्र भल्लातक पलाशा नन्दीवृक्षश्चेति । न्यग्रोधादिर्गणोव्रण्यः संग्राही भग्नसाधकः । रक्तपित्तहरो दाहमेदोघ्नो योनिदोषहृत् ॥ सु. सू. 38/48-49

1. *Nyagrodha* (*Ficus benghalensis*)
2. *Udumbara* (*Ficus glomerata*)
3. *Ashwattha* (*Ficus religiosa*)
4. *Plaksha* (*Ficus lacor*)
5. *Madhuka* (*Glycyrrhiza glabra*)
6. *Kapitana* (*Thespesia populnea*)
7. *Kakubha* (*Terminalia arjuna*)
8. *Amra* (*Mangifera indica*)
9. *Koshamra* (*Schleichera trijuga*)
10. *Chorakapatra* (*Angelica glauca* leaves)
11. *Raja Jambu* (*Eugenia jambolana*)

12. *Kaka Jambu* (*Eugenia operculata*)
13. *Priyala* (*Buchanania lanzan*)
14. *Madhuka* (*Madhuca indica*)
15. *Rohini* (*Myrica nagi*)
16. *Vanjula* (*Salix caprea*)
17. *Kadamba* (*Anthocephalus cadamba*)
18. *Badari* (*Zizyphus jujuba*)
19. *Tinduki* (*Diospyros embryopteris*)
20. *Sallaki* (*Boswellia serrata*)
21. *Rodhra* (*Symplocos racemosa*)
22. *Sabara lodhra* (*Symplocos crategoides*)
23. *Bhallataka* (*Semecarpus anacardium*)
24. *Palasha* (*Butea monosperma*)
25. *Nandivraksha* (*Thespesia populnea*)

Total number of drugs mentioned in this *Gana* is 25.

Doshakarma: Pittahara

Indications: *Vrana, Bhagna, Daha, Medoroga* and *Yonidosha*

26. Guduchyadi Gana

गुडूचीनिम्बकुस्तुम्बुरुचन्दनानि पद्मकं चेति ।
राषसर्वज्वरान् हन्ति गुडूच्यादिस्तु दीपनः । हृल्लासारोचकवमीपिपासा दाहनाशनः ॥
सु. सू. 38/50-51

1. *Guduchi* (*Tinospora cordifolia*)
2. *Nimba* (*Azadirachta indica*)
3. *Kustumburu* (*Coriandrum sativum*)
4. *Chandana* (*Santalum album*)
5. *Padmaka* (*Prunus cerasoides*)

Totally 5 drugs are mentioned in this *Gana*.

Doshakarma: *Kaphahara*

Indications: *Sarvajvara, Agnimandya, Hrillasa, Arochaka, Chardi, Pipasa* and *Daha*.

27. Utpaletyadi Gana

उत्पलरक्तोत्पलकुमुदसौगन्धिककुवलयपुण्डरीकाणि मधुकं चेति । उत्पलादिरियं दाहपित्तरक्तविनाशनः । पिपासाविषहृद्रोगच्छर्दिमूर्च्छाहरोगणः ॥ सु. सू. 38/52-53

1. *Utpala* (*Nymphaea stelleta*)
2. *Raktotpala* (*Nymphaea rubra*)
3. *Kumuda* (*Nymphaea alba*)
4. *Saugandhika* (*Nymphaea* Sp.)
5. *Kuvalaya* (*Nymphaea* Sp.)
6. *Pundarika* (*Nelumbium speciosum*)
7. *Madhuka* (*Glycyrrhiza glabra*)

Total drugs in this *Gana* are 7.

Doshakarma: Pittahara

Indications: *Raktapitta, Pipasaa, Visha, Hradroga, Chardi & Murcha.*

28. Mustadi Gana

मुस्ताहरिद्रादारुहरिद्राहरीतव्हयामलकविभीतक कुष्ठहैमवतीवचापाठाकटुरोहिणी शार्ङ्गष्टातिविषा-द्राविडीभल्लातकानि चित्रकश्चेति । एष मुस्तादिको नाम्ना गणः श्लेष्मनिषूदनः। योनिदोषहरः स्तन्यशोधनः पाचनस्तथा ॥ सु. सू. 38/54-55

1. *Musta* (*Cyperus rotundus*)
2. *Haridra* (*Curcuma longa*)
3. *Daruharidra* (*Berberis aristata*)
4. *Haritaki* (*Terminalia chebula*)
5. *Amalaka* (*Emblica officinalis*)
6. *Vibhitaka* (*Terminalia belerica*)
7. *Kushtha* (*Saussurea lappa*)
8. *Haimavati* (*Iris germanica*)
9. *Vacha* (*Acorus calamus*)
10. *Patha* (*Cissampelos pereira*)
11. *Katurohini* (*Picrorrhiza kurroa*)
12. *Sharngeshta* (*Solanum nigrum*)
13. *Ativisha* (*Aconitum heterophyllum*)
14. *Dravidi* (*Elattaria cardamomum*)
15. *Bhallataka* (*Semecarpus anacardium*)
16. *Chitraka* (*Plumbago zeylanica*)

Total drugs in this *GaNa* are 16.

Doshakarma: Kaphahara

Indications: *Yonidosha, Stanyadushti* and *Ajirna*

29. Haritakyadi Gana

हरीतकयामलकविभीतकानीति त्रिफला । त्रिफला कफपित्तघ्नी मेहकुष्ठविनाशनी ।
चक्षुष्या दीपनी चैव विषमज्वरविनाशनी ॥ सु. सू. 38/56-57

1. *Haritaki* (*Terminalia chebula*)
2. *Amalaka* (*Emblica officinalis*)
3. *Vibhitaki* (*Terminalia belerica*)

These three drugs are also called as *Triphala.*

Doshakarma: Kapha Pittahara

Indications: *Meha, Kushtha, Netraroga, Agnimandya* and *Vishama Jwara*

30. Pippalyadi Gana

पिप्पलीमरिचशृङ्गवेराणीति त्रिकटुकम् ॥
त्र्युषणं कफमेदोघ्नं मेहकुष्ठत्वागामयान् । निहन्याद्दीपनं गुल्मपीनसाग्न्यल्पतामपि ॥
सु. सू. 38/58-59

1. *Pippali* (*Piper longum*)
2. *Maricha* (*Piper nigrum*)
3. *Shringavera* (*Zingiber officinale*)

These three drugs are also called as *Trikatu. Tryushana* is *Paryaya* of *Trikatu.*

Doshakarma: Kaphahara

Indications: *Medoroga, Meha, Kushtha, Twagroga, Agnimandya, Gulma* and *Pinasa.*

31. Amalakyadi Gana

आमलकीहरीतकीपिप्पल्यश्चित्रकश्चेति ।
आमलकयादिरित्येष गणः सर्वज्वरापहः । चक्षुष्यो दीपनोवृष्यः कफारोचकनाशनः ॥
सु. सू. 38/60-61

1. *Amalaki* (*Emblica officinalis*)
2. *Haritaki* (*Terminalia chebula*)
3. *Pippali* (*Piper longum*)
4. *Chitraka* (*Plumbago zeylanica*)

Total drugs in this *Gana* are 4.

Doshakarma: Kaphahara

Indications: *Sarvajvara, Netravikara, Agnimandya, Klaibya* and *Arochaka.*

32. *Trpvadi Gana*

त्रपुसीसताम्ररजतसुवर्णकृष्णलोहानि लोहमलश्चेति ।
गणस्त्रप्वादिरित्येष गरक्रिमिहरः परः । पिपासाविषहृद्रोग पाण्डु मेहहरस्तथा ॥
सु. सू. 38/62-63

1. *Trapu* (*Vanga*) (Tin)-Stannum
2. *Sisa* (*Naga*) (Lead)-Plumbum
3. *Tamra* (Copper)-Cuprum
4. *Rajata* (Silver)-Argentum
5. *Suvarna* (Gold)-Aurum
6. *Krishnaloha* (*Tikshna loha*) Ferum-(Iron)
7. *Lohamala*-Ferro-ferric oxide

Totally 7 *Parthiva Dravyas* are mentioned in this *Gana.*

Indications: *Garavisha, Krmi, Pipasa, Visha, Hrdroga, Pandu* and *Meha.*

33. *Lakshadi Gana*

लाक्षारेवतकुटजाश्वमारकट्फलहरिद्राद्वयनिम्बसप्तच्छदमालत्यस्त्रायमाणा चेति ।
कषायतिक्त मधुरः कफपित्तार्तिनाशनः । कुष्ठक्रिमिहरश्चैव दुष्टव्रणविशोधनः ॥
सु. सू. 38/64-65

1. *Laksha* (*Laccifera lacca*)
2. *Arevata* (*Cassia fistula*)
3. *Kutaja* (*Holarrhena antidysenterica*)
4. *Ashwamara* (*Nerium indicum*)
5. *Katphala* (*Myrica nagi*)
6. *Haridra* (*Curcuma longa*)
7. *Daruharidra* (*Berberis aristata*)
8. *Nimba* (*Azadirachta indica*)
9. *Saptacchada* (*Alstonia scholaris*)
10. *Malati* (*Jasminum grandiflorum*)
11. *Trayamana* (*Gentiana kurroa*)

11 drugs are mentioned in this *Gana.*

Doshakarma: Kapha Pittahara

Indications: *Arti, Kushtha, Krimi* and *Dushta Vrana.*

34. Kaniya Panchamula

तत्र त्रिकण्टकबृहतीद्वय पृथक्पर्ण्यौ विदारिगन्धा चेति कनीयः ।
कषायतिक्तमधुरं कनीयः पञ्चमूलकम् । वातघ्नं पित्तशमनं बृंहणं बलवर्धनम् ॥
सु. सू. 38/66-67

1. *Trikantaka (Tribulus terrestris)*
2. *Brahati (Solanum indicum)*
3. *Kantakari (Solanum xanthocarpum)*
4. *Prthakparni (Uraria picta)*
5. *Vidarigandha (Desmodium gangeticum)*

These drugs are also called as *Laghu Panchamula.*

Dosha Karma: Vata Pittahara

Indications: *Karshya* and *Dourbalya*

35. Mahat Panchamūla

बिल्वाग्निमन्थटिण्टुक पाटलाः काश्मरी चेति महत् ।
सतिक्तं कफवातघ्नं पाके लध्वग्निदीपनम् । मधुरानुरसं चैव पञ्चमूलं महत् स्मृतम् ॥
सु. सू. 38/68-69

1. *Bilva* (Aegle marmelos)
2. *Agnimantha (Premna integrifolia)*
3. *Tintuka (Oroxylum indicum)*
4. *Patala (Stereospermum suaveolens)*
5. *Kashmari (Gmelina arboroea)*

These drugs are also called as *Brhat Panchamula.*

Doshakarma : Kaphavatahara

Indications: *Agnimāndya*

अनयोर्दशमूलमुच्यते ।
गणः श्वासहरो ़्षेष कफपित्तातिलापहः । आमस्य पाचनश्चैव सर्वज्वरविनाशनः ॥
सु. सू. 38/70-71

Combination of *Kaniya* and *Mahat Panccamula* is called as *Dashamula.*

Doshakarma : Tridoshahara

Indications: *Shwasa, Ajirna* and *Sarva jwara.*

36. *Vallipanchamula*

विदारीसारिवारजनीगुडूच्योऽजशृङ्गी चेति वल्लीसंज्ञः ॥ सु. सू. 38/72

1. *Vidari* (*Pureria tuberosa*)
2. *Sariva* (*Hemidesmus indicus*)
3. *Rajani* (*Curcuma longa*) /(*Rubia cordifolia*)
4. *Guduchi* (*Tinospora cordifolia*)
5. *Ajashrngi* (*Gymnema sylvestrae*)

Doshakarma: Pittashamaka

Indications: *Trividha shotha, Sarvameha* and *Shukradosha.*

37. *Kantaka Panchamula*

करमर्दत्रिकण्टकसैरीयकशतावरी गृध्रनख्य इति कण्टक संज्ञः ।
रक्तपित्तहरौ ध्येतौ शोफत्रयविनाशनौ । सर्वमेहहरौ चैव शुक्रदोषविनाशनौ ॥
सु. सू. 38/73-74

1. *Karamarda* (*Carissa carandes*)
2. *Trikantaka* (*Tribulus terrestris*)
3. *Saireyaka* (*Barleria prionitis*)
4. *Shatavari* (*Asparagus racemosus*)
5. *Grdhranakhya* (*Capparis zeylanica*)

Both *Vallipancamula* and *Kantaka Panchamūla* are having same properties.

Doshakarma: Pittashamaka

Indications: *Trividha Shotha, Sarvameha* and *Shukradosha.*

38. *Tranapanchamula*

कुशकाशनलदर्भकाण्डेक्षुका इति तृण संज्ञकः ।
मूत्रदोषविकारं च रक्तपित्तं तथैव च । अन्त्यः प्रयुक्तः क्षीरेण शीघ्रमेव विनाशयेत् ॥
सु. सू. 38/75-76

1. *Kusha* (*Desmostachya bipinnata*)
2. *Kasha* (*Saccharum spontaneum*)
3. *Nala* (*Phragmites kirka*)
4. *Darbha* (*Imperata cylindrica*)
5. *Kandekshu* (*Saccharum officinarum*)

Doshakarma: Pittahara

Indications: *Raktapitta*

II. Classification of Drugs in *Ashtanga Hridaya*:

In *Ashtaga Hradaya* there is no separate chapter for *Pancha-karmokta Dravyas* and *Dosha Prakopahara Dravyas.* Including all the *Vargas* total number of *Vargas* or *Ganas* are 32.

1. Vamana Gana

मदनमधुकलम्बानिम्बबिम्बीविशालात्रपुसकुटजमूर्वादेवदालीकृमिघ्नम् ।
विदुल दहनचित्राः कोशवत्यौ करञ्जः कणालवणवचैलासर्षपाश्छर्दनानि ॥ अ. हृ. सू. 15/1

1. *Madana* (*Randia dumetorum*)
2. *Madhuka* (*Glycyrrhiza glabra*)
3. *Lamba* (*Lagenaria vulgaris*)
4. *Nimba* (*Azadirachta indica*)
5. *Bimbi* (*Coccinia grandis*)
6. *Vishala* (*Citrullus colocynthis*)
7. *Trapusha* (*Cucumis sativus*)
8. *Kutaja* (*Holarrhena antidysenterica*)
9. *Murva* (*Marsedenia tenasicima*)
10. *Devadali* (*Luffa echinata*)
11. *Krmighna* (*Embelia ribes*)
12. *Vidula* (*Salix caprea*)
13. *Dahana* (*Plumbago zeylanica*)
14. *Chitra* (*Tricosanthes dioica*)
15. *Koshataki* (*Luffa acutangula*)
16. *Raja Koshataki* (*Luffa cylindrica*)
17. *Karanja* (*Pongamia pinnata*)
18. *Kasha* (*Piper longum*)
19. *Lavana* (Rock salt)
20. *Vacha* (*Acorus calamus*)
21. *Ela* (*Elattaria cardamomum*)
22. *Sarshapa* (*Brassica campestris*)

Totally 22 *Vamana Dravyas* are mentioned in this *Gana.*

2. Virechana Gana

निकुम्भकुम्भत्रिफलागवाक्षीस्नुक्शङ्खिनीनीलिनितिल्वकानि ।
शम्याककम्पिल्लकहेमदुग्धा दुग्धं च मूत्रं च विरेचनानि ॥ अ. हृ. सू. 15/2

1. *Nikumbha* (*Baliospermum montanum*)
2. *Kumbha* (*Operculina turpathem*)
3. *Haritaki* (*Terminalia chebula*)
4. *Amalaki* (*Emblica officinalis*)
5. *Vibhitaki* (*Terminalia belerica*)
6. *Gavakshi* (*Citrullus colocynthis*)
7. *Snuk* (*Euphorbia neirifolia*)
8. *Shankhini* (*Euphorbia tirucolli*)
9. *Nilini* (*Indigofera tinctoria*)
10. *Tilvaka* (*Symplocos racemosa*)
11. *Shyamyaka* (*Cassia fistula*)
12. *Kampillaka* (*Mallotus philippinensis*)
13. *Hemadugdhi* (*Garcinia morella*)
14. *Dugdha* (Milk)
15. *Mutra* (Urine)

Totally 15 *Dravyas* are mentioned in this *Gana*.

3. Niruhagana

मदनकुटजकुष्ठदेवदालीमधुकवचादशमूलदारुरास्नाः ।
यवमिशिकृतवेधनं कुलत्था मधु लवणं त्रिवृता निरुहणानि ॥ अ. हृ. सू. 15/3

1. *Madana* (*Randia spinosa*)
2. *Kutaja* (Holarhena antidysenterica)
3. *Kushtha* (*Saussurea lappa*)
4. *Devadali* (*Luffa echinata*)
5. *Madhuka* (*Madhuca indica*)
6. *Vacha* (*Acorus calamus*)
7. *Bilva* (*Aegle marmelos*)
8. *Agnimantha* (*Premna integrifolia*)
9. *Shyonaka* (*Oroxylum inidcum*)
10. *Patala* (*Stereospermum suaveolens*)
11. *Gambhari* (*Gmelina arboroea*)
12. *Shalaparni* (*Desmodium gangeticum*)
13. *Prishniparni* (*Uraria picta*)
14. *Bruhati* (*Solanum indicum*)

15. *Kantakari* (*Solanum xanthocarpum*)
16. *Gokshuura* (*Tribulus terestris*)
17. *Daru* (*Cedrus deodora*)
18. *Rasna* (*Pluchea lanceolata*)
19. *Yava* (*Hordium vulgare*)
20. *Mishi* (*Anethum sowa*)
21. *Kratavedhana* (*Luffa cylindrica*)
22. *Kulattha* (*Dolichos biflorus*)
23. *Madhu* (Honey)
24. *Lavana* (Salt)
25. *Trivrit* (*Operculina turpathem*)

Totally 25 *Dravyas* are mentioned in this *Gana.*

4. Navana Gana

वेल्लापामार्गव्योषदार्वीसुराला बीजं शैरीषं बार्हतं शैग्रवं च ।
सारो माधूकः सैन्धवं तार्क्ष्यशैलं त्रुब्यौ पृथ्वीका शोधयन्त्युत्तमाङ्गम् ॥ अ. हृ. सू. 15/4

1. *Vella* (*Embelia ribes*)
2. *Apamarga* (*Achyranthes aspera*)
3. *Pippali* (*Piper longum*)
4. *Marica* (*Piper nigrum*)
5. *Shunthi* (*Zingiber officinale*)
6. *Darvi* (*Berberis aristata*)
7. *Surala* (*Vateria indica*)
8. *Shairisha Bija* (Seeds of *Albizzia labback*)
9. *Bruhati Bija* (Seeds of *Solanum indicum*)
10. *Shigru Bija* (Seeds of *Moringa oleifera*)
11. *Madhūkasara* (Juice of flowers of *Madhuca indica*)
12. *Saindhava* (Rock salt)
13. *Tarkshya Shaila* (Collyrium)
14. *Sukshmaila* (*Elattaria cardamomum*)
15. *Sthulaila* (*Ammomum subulatum*)
16. *Prithvika* (Leaves of *Ferula narthex*)

These 16 *Dravyas* are included under *Nirūha Gana.*

5. *Vataghna Gana*

भद्रदारू नतं कुष्ठं दशमूलं बलाद्वयम् । वायुंवीरतरादिश्च विदार्यादिश्चनाशयेत् ॥
अ. हृ. सू. 15/5

1. *Bhadradaru* (*Cedrus deodara*)
2. *Nata* (*Valeriana wallaichi*)
3. *Kushtha* (*Saussurea lappa*)
4. *Bilva* (*Aegle marmelos*)
5. *Agnimantha* (*Premna integrifolia*)
6. *Shyonaka* (*Oroxylum indicum*)
7. *Patala* (*Stereospermum suaveolens*)
8. *Gambhari* (*Gmelina arboroea*)
9. *Shaalaparni* (*Desmodium gangeticum*)
10. *Prishniparni* (*Uraria picta*)
11. *Brahati* (*Solanum indicum*)
12. *Kantakari* (*Solanum xanthocarpum*)
13. *Gokshura* (*Tribulus terrestris*)
14. *Bala* (*Sida cordifolia*)
15. *Atibala* (*Abutilon indicum*)

and *Drugs* of *Viratarvadi* and drugs of *Vidaryadi Gana* have been included in this *Gana*.

6. Pittaghna Gana

दूर्वाऽनन्ता निम्बवासाऽत्मगुप्ता गुन्द्राऽभीरुः शीतपाकी प्रियङ्गुः ।
न्यग्रोधादिः पद्मकादिः स्थिरे द्वे पद्मं वन्यं सारिवादिश्च पित्तम् ॥ अ. हृ. सू. 15/6

1. *Durva* (*Cynodon dactylon*)
2. *Ananta* (*Yavashaka - Alhagi camelorum*)
3. *Nimba* (*Azadirachta indica*)
4. *Vasa* (*Adhatoda vasica*)
5. *Atmagupta* (*Mucuna pruriens*)
6. *Gundra* (*Typha angustata*)
7. *Abhiru* (*Asparagus racemosus*)
8. *Shitapaki* (*Solanum nigrum*)
9. *Priyangu* (*Callicarpa macrophylla*)
10. *Shaliparni* (*Desmodium gangeticum*)

11. *Prashniparni* (*Uraria picta*)
12. *Padma* (*Nelumbo nucifera*)
13. *Vanya* (*Kshudra Musta - Ceyperus scariosus*)

and the drugs of *Nyagrodhadi, Padmakadi* and *Sarivadi Gana* of *Sushruta* have been included under *Pittaghna Gana.*

7. Shleshmaghna Gana

आरग्वधादिरर्कादिर्मुष्ककाद्योऽसनादिकः । सुरसादिः समुस्तादिर्वत्सकादिर्बलासजित् ॥

अ. हृ. सू. 15/7

The drugs of *Aragwadhadi, Arkadi, Mushkakadi, Asanādi, Surasadi, Mustadi* and *Vatsakadi Ganokta Dravyas* are included under *Kapha Shamaka Gana.*

8. Jivaniyagana/Jivantyadi Gana

जीवन्ती काकोल्यौ मेदे द्वे मुद्गमाषपर्ण्यो च । ऋषभकजीवक मधुकं चेति गणो जीवनीयाख्यः ॥

अ. हृ. सू. 15/8

1. *Jivanti* (*Leptadenia reticulata*)
2. *Kakoli* (*Lillium polyphyllum*)
3. *Kshirakakoli* (*Lillium* polyphyllum)
4. *Meda* (*Polygonatum cirrhafolium*)
5. *Mahameda* (*Polygonatum verticillatum*)
6. *Mudgaparni* (*Vigna trilobata*)
7. *Mashaparni* (*Teramnus labialis*)
8. *Rishabhaka* (*Microstylis mucifera*)
9. *Jivaka* (*Microstylis wallichi*)
10. *Madhuka* (*Glycyrrhiza glabra*)

10 drugs are included in this *Gana.*

9. Vidaryadi Gana

विदारिपञ्चाङ्गुलवृश्चिकाली वृश्चीव देवाह्वयशूर्पपर्ण्यः ।
कण्डूकरी जीवनह्रस्वसंज्ञे द्वे पञ्चके गोपसुता त्रिपादी ॥
विदार्यादिरियं हृद्यो बृंहणो वातपित्तहा । शोषगुल्माङ्गमर्दोर्ध्वश्वासकासहरो गणः ॥

अ. हृ. सू. 15/9-10

1. *Vidari* (*Peureria tuberosa*)
2. *Panchangula* (*Ricinus communis*)
3. *Vrschikali* (*Pergularia extensa*)

4. *Vrschiva* (*Boerhavia diffusa*)
5. *Devahvaya* (*Cedrus deodara*)
6. *Mudgaparni* (*Vigna trilobata*)
7. *Mashaparni* (*Teramnus labialis*)
8. *Kandukari* (*Mucuna pruriens*)
9. *Abhiru* (*Asparagus racemosus*)
10. *Vira* (*Terminalia arjuna*)
11. *Jivanti* (*Leptadenia reticulata*)
12. *Jivaka* (*Microstylis wallichi*)
13. *Rishabhaka* (*Microstylis mucifera*)
14. *Brhati* (*Solanum indicum*)
15. *Kantaakari* (*Solanum xanthocarpum*)
16. *Shalaparni* (*Desmodium gangeticum*)
17. *Prishniparni* (*Uraria picta*)
18. *Gokshura* (*Tribulus terrestris*)
19. *Gopasuta* (*Hemidesmus indicus*)
20. *Tripadi* (*Adiantum lunulatum*)

Properties: *Vatapittahara, Brimhana*

Indications: *Shosha, Gulma, Angamarda, Urdhwa Shwasa & Kasa.*

10. Sarivadi Gana

सारिवोशीरकाश्मर्यमधूकशिशिरद्वयम् । यष्टी परुषकं हन्ति दाहपित्तास्रतृड्ज्वरान् ॥

अ. हृ. सू. 15/11

1. *Sariva* (*Hemidesmus indicus*)
2. *Ushira* (*Vetiveria zizanoides*)
3. *Kashmarya* (*Gmelina arboroea*)
4. *Madhuka* (*Madhuca indica*)
5. *Chandana* (*Santalum album*)
6. *Raktachandana* (*Pterocarpus santalinus*)
7. *Yashti* (*Glycyrrhiza glabra*)
8. *Parushaka* (*Grewia asiatica*)

Property: *Pittahara*

Indications: *Daha, Raktapitta, Trit & Jwara.*

11. Padmakadi Gana

पद्मकपुण्ड्रौवृद्धितुगर्द्धः शृङ्ग्यमृता दश जीवनसंज्ञाः । स्तन्यकरा घ्नन्तीरणपित्तं प्रीणनजीवनबृंहणवृष्याः ॥ अ. हृ. सू. 15/12

1. *Padmaka* (*Nelumbium speciosum*)
2. *Pundra* (*Nelumbo nucifera*)
3. *Vraddhi* (*Eulophia nuda*)
4. *Tuga* (*Bambusa arundinaceae*)
5. *Riddhi* (*Habenaria intermedia*)
6. *Shringi* (*Pistacia integerrima*)
7. *Amrata* (*Tinospora cordifolia*)

and 10 drugs of *Jivantyadi Gana*

Properties: *Stanyajanaka, Prinana, Jivana, Brahmana, Vrashya, Vatapitthara.*

12. Parushakadi Gana

परुषकं वरा द्राक्षा कट्फलं कतकात् फलम् । राजाह्व दाडिमं शाकं तृण्मूत्रामयवातजित् ॥

अ. हृ. सू. 15/13

1. *Parushaka* (*Grewia asiatica*)
2. *Haritaki* (*Terminalia chebula*)
3. *Amalaki* (*Emblica officinalis*)
4. *Vibhitaki* (*Terminalia belerica*)
5. *Draksha* (*Vitis vinifera*)
6. *Katphala* (*Myrica nagi*)
7. *Katakaphala* (*Strychnos potatorum*)
8. *Rajahwa* (*Rajadana - Manilkara hexandra*)
9. *Dadima* (*Punica granatum*)
10. *Shaka* (*Tectona grandis*)

Property: *Vatahara*

Indications: *Trishna, Mutramaya.*

13. Anjanadi Gana

अञ्जनं फलिनी मांसी पद्मोत्पल रसाञ्जनम् । सैलामधुकनागाह्वं विषान्तर्दाहपित्तनुत् ॥

अ. हृ. सू. 15/14

1. *Anjana* (*Srotonjana*)
2. *Phalini* (*Callicarpa macrophylla*)

3. *Mamsi* (*Nardostachys jatamansi*)
4. *Padma* (*Nelumbium speciosum*)
5. *Utpala* (*Nymphaea stelleta*)
6. *Rasanjana* (Coryllium)
7. *Ela* (*Elattaria cardamonum*)
8. *Madhuka* (*Glycyrrhiza glabra*)
9. *Nagahwa* (*Mesua ferrea*)

Properties: *Pittahara, Vishahara & Daha hara.*

14. Patoladi Gana

पटोलकटुरोहिणीचन्दनंमधुस्त्रवगुडूचिपाठान्वितम् ।
निहन्ति कफपित्तकुष्ठज्वरान् विषं वमिमरोचक कामलाम् ॥ अ. हृ. सू. 15/15

1. *Patola* (*Tricosanthes dioica*)
2. *Katurohini* (*Picrorrhiza kurroa*)
3. *Chandana* (*Santalum album*)
4. *Madhusrava* (*Marsedenia tenacissima*)
5. *Guduchi* (*Tinospora cordifolia*)
6. *Patha* (*Cissampelos pereira*)

Doshakarma: Kaphapittahara

Indications: *Kushtha, Jwara, Visha, Chardi, Arochaka & Kamala.*

15. Guduchyadi Gana

गुडूचीपद्मारिष्टधानकारक्तचन्दनम् । पित्तश्लेष्मज्वरच्छर्दिदाहतृष्णाहरमग्निकृत् ॥

अ. हृ. सू. 15/16

1. *Guduchi* (*Tinospora cordifolia*)
2. *Padma* (*Prunus cerasoides*)
3. *Arishta* (*Azadirachta indica*)
4. *Dhanaka* (*Coriandrum sativum*)
5. *Raktachandana* (*Pterocarpus santalinus*)

Doshakarma: Pittakaphahara

Indications: *Jwara, Chardi, Daha, Trishna & Agnimandya.*

16. Aragwadhadi Gana

आरग्वधेन्द्रयवपाटलिकाकतिक्तानिम्बामृतामधुरसास्त्रुववृक्षपाठाः ।
भूनिम्बसैर्यकपटोलकरञ्जयुग्मसवहतच्छदाग्निसुषवीफलबाणघोण्टाः ॥

आरग्वधादिर्जयति छर्दिकुष्ठविषज्वरान् । कफं कण्डूं प्रमेहं च दुष्टव्रण विशोधनः ॥

अ. हृ. सू. 15/17-18

1. *Aragwadha* (*Cassia fistula*)
2. *Indrayava* (Seed of *Holarrhena antidysenterica*)
3. *Patali* (*Stereospermum suaveolens*)
4. *Kakatikta* (*Solanum nigrum*)
5. *Nimba* (*Azadirachta indica*)
6. *Amruta* (*Tinospora cordifolia*)
7. *Madhurasa* (*Marsedenia tenacissima*)
8. *Sruvavriksha* (*Flacortia montana*)
9. *Patha* (*Cissampelos pareira*)
10. *Bhunimba* (*Swertia chirata*)
11. *Sairyaka* (*Sahacara - Barleria cristata*)
12. *Patola* (*Tricosanthes dioica*)
13. *Putikaranja* (*Holoptelia integrifolia*)
14. *Karanja* (*Pongamia pinnata*)
15. *Saptacchada* (*Alstonia scholaris*)
16. *Agni* (*Plumbago zeylanica*)
17. *Sushavi* (*Momordica charantia*)
18. *Phalam* (*Randia dumetorum*)
19. *Bana* (*Sahacara-Nilavarna - Barleria strigosa*)
20. *Ghonta* (*Zizyphus jujuba*)

Doshakarma: Kaphahara

Indications: *Chardi, Kushtha, Visha, Jwara, Kandu, Prameha* and *Dushta Vrana*

17. Asanadi Gana

असनतिनिशभूर्जश्वेतवाहप्रकीर्याः खदिरकदर भण्डीशिंशिपामेषशृङ्ग्यः ।
त्रिहिमं तालपलाशा जोङ्गक शाकशालौक्रमुकधवकलिङ्गच्छागकर्णाश्वकर्णाः ॥
असनादिर्विजयते श्वित्रकुष्ठकफक्रिमीन् । पाण्डुरोगं प्रमेहं च मेदोदोषनिबर्हणः ॥

अ. हृ. सू. 15/19-20

1. *Asana* (*Pterocarpus marsupium*)
2. *Tinisha* (*Ougeinia dalbergiodes*)
3. *Bhurja* (*Betula utilis*)
4. *Shwetavaha* (*Terminalia arjuna*)

5. *Prakirya (Holoptelia integrifolia)*
6. *Khadira (Acasia catechu)*
7. *Kadara (Acasia sumo)*
8. *Bhandi (Albizzia labback)*
9. *Shimshipa (Dalbergia sissoo)*
10. *Meshashringi (Gymnema sylvestre)*
11. *Malayaja (Santalum album)*
12. *Rakta Chandana (Pterocarpus santalinus)*
13. *Daruharidra (Berberis aristata)*
14. *Tala (Borasus flabellifera)*
15. *Palasha (Butea monosperma)*
16. *Jongaka (Aquillaria agallocha)*
17. *Shaka (Tectona grandis)*
18. *Shala (Shorea robusta)*
19. *Kramuka (Areca catechu)*
20. *Dhava (Anogeissus latifolia)*
21. *Kalinga (Holarrhena antidysenterica)*
22. *Chagakarna (Dipterocarpus* Sp)
23. *Ashwakarna (Dipterocarpus alatus)*

Doshakarma: Kaphahara

Indications: *Shwitra, Kushtha, Krimi, Pandu, Prameha, Medodosha* and *Visha.*

18. Varunadi Gana

वरुणसैर्यकयुग्मशतावरीदहनमोरटबिल्वविषणिकाः ।
द्विबृहतीद्विकरञ्जजयाद्वयंबहलपल्लव दर्भरुजाकराः ॥
वरुणादिः कफं मेदो मन्दाग्नित्वं नियच्छति ।
आढ्यवातं शिरःशूलं गुल्मं चान्तः सविद्रधिम् ॥ अ. हृ. सू. 15/21-22

1. *Varuna (Crateava nurvala)*
2. *Sairyaka (Raktapushpa)- (Barleria cristata)*
3. *Sairyaka (Pitapushpa - Barleria prionitis)*
4. *Shatavari (Asparagus racemosus)*
5. *Dahana (Plumbago zeylanica)*
6. *Morata (Marsedenia tenacissima)*
7. *Bilva (Aegle marmelos)*

8. *Vishanika* (Horn of deer)
9. *Brhati* (*Solanum indicum*)
10. *Kantakari* (*Solanum xanthocarpum*)
11. *Putikaranja* (*Holopteila integrifolia*)
12. *Karanja* (*Pongamia pinnata*)
13. *Tarkari* (*Jaya*) (*Premna integrifolia*)
14. *Haritaki* (*Jaya*) (*Terminalia chebula*)
15. *Bahalapallava* (*Moringa oleifera*)
16. *Darbha* (*Desmostachya bipinnata*)
17. *Rujakara* (*Hintala - Phoenix paludosa*)

Doshakarma: Kaphahara

Indications: *Agnimandya, Medoroga, Adhyavata, Shirashula, Gulma* and *Antarvidradhi.*

19. Ushakadi Gana

ऊषकंस्तुत्थकं हिङ्गुकासीसद्वय सैन्धवम् । सशिलाजतु कृच्छ्राश्मगुल्ममेदः कफापहम् ॥

अ. हृ. सू. 15/23

1. *Ushaka* (*Dorema ammoniacum*)
2. *Tutthaka* (Copper sulphate)
3. *Hingu* (Ferula narthex)
4. *Kasisa* (Ferrous sulphate)
5. *Pushpakasisa* (Ferrous sulphate)
6. *Saindhava* (Rock salt)
7. *Shilajatu* (Bitumen)

Doshakarma: Kaphahara

Indications: *Mutrakricchra, Ashmari, Gulma* and *Medoroga.*

20. Viratarvadi Gana

वेल्लन्तरारणिकबूकवृषाश्मभेदगोकण्टकेत्कटसहाचरबाणकाशाः ।
वृक्षादनीनलकुशद्वयगुण्ठगुन्द्रा भल्लूकमोरटकुरण्टकरम्भपार्थाः ॥
वर्गो वीरतराद्योऽयं हन्ति वातकृतान् गदान् । अश्मरीशर्करामूत्रकृच्छ्राघातरुजाहरः ॥

अ. हृ. सू. 15/24

1. *Viratara* (*Dicrostachys cineria*)
2. *Aranika* (*Premna integrifolia*)
3. *Buka* (*Bakapushpa - Osmanthum fragrans*)

4. *Vrisha (Adhatoda vasica)*
5. *Ashmabheda (Berginia ligulata)*
6. *Gokantaka (Tribulus terrestris)*
7. *Itkata (Typha elephantina)*
8. *Sahachara (Saireyaka -Barleria proionitis)*
9. *Bana (Nila saireyaka - Barleria strigosa)*
10. *Kasha (Saccharum spontaneum)*
11. *Vrkikshdani (Loranthus longiflorus)*
12. *Nala (Arundo donax)*
13. *Sukshma Dūrva (Cynodon dactylon)*
14. *Sthula Dūrva (Cynodon dactylon)*
15. *Guntha (Vrttatrana - Typha australis)*
16. *Gundra (Typha elephantiana)*
17. *Bhalluka (Oroxylum indicum)*
18. *Morata (Marsedenia tenacissima)*
19. *Kuranta (Sitivara - Celosia argentea)*
20. *Karambha (Uttamarani - Pergularia extensa)*
21. *Partha (Adityabhakta - Malva rotundifolia)*

Doshakarma : Vatahara

Indications: *Vatavyadhi, Ashmari, Sharkara, Mutrakricchra Mutraghata*

21. Rodhradi Gana

रोध्रशाबरकरोध्रपलाशाजिङ्गिणीसरलकट्फलयुक्ताः ।
कुत्सिताम्बकदलीगतशोकाः सैलवालुपरिपेलवमोचाः ॥
राष रोध्रादिको नाम मेदःकफहरो गणः । योनिदोषहरः स्तम्भी वर्ण्यो विषविनाशनः ॥

अ. हृ. सू. 15/26-27

1. *Rodhra (Symplocos racemosa)*
2. *Shabarakarodhra (Symplocos crategoides)*
3. *Palaśa (Butea monosperma)*
4. *Jingini (KrishnaShalmali - Odina woodier)*
5. *Sarala (Pinus roxburghi)*
6. *Katphala (Myrica nagi)*
7. *Yukta (Pluchea lanceolata)*
8. *Kutsitamba (Anthocephalus cadamba)*

9. *Kadali* (*Musa paradisica*)
10. *Gatashoka* (*Saraca asoca*)
11. *Elavaluka* (*Prunus cerasus*)
12. *Paripelava* (*Kutannata* - *Oroxylum indicum*)
13. *Mocha* (*Niryasa* of *Salmalia malabarica*)

Doshakarma: Kaphahara

Indications: *Medoroga, Yonidosha, Vaivarnya & Visha*

22. Arkadi Gana

अर्कालर्कौ नागदन्ती विशल्या भार्ङ्गी रास्नावृश्चिकालीप्रकीर्या ।
प्रत्यक्पुष्पी पीततैलोदकीर्याश्वेतायुग्मं तापसानां च वृक्षः ॥
अयमर्कादिको वर्गः कफमेदोविषापहः । कृमिकुष्ठप्रशमनोविशेषाद्व्रणशोधनः ॥

अ. हृ. सू. 15/28-29

1. *Arka* (*Calotropis procera*)
2. *Alarka* (*Calotropis gigantea*)
3. *Nagadanti* (*Baliospermum calycinum*)
4. *Vishalya* (*Gloriosa superba*)
5. *Bharangi* (*Clerodendron serratum*)
6. *Rasna* (*Pluchea lanceolata*)
7. *Vrschikali* (*Pergularia extensa*)
8. *Prakirya* (*Pongamia pinnata*)
9. *Pratyakpushpi* (*Achyranthes aspera*)
10. *Pitataila* (*Kakadani* - *Celastrus paniculatus*)
11. *Udakirya* (*Holoptella integrifolia*)
12. *Kinihi* (*Albizia procera*)
13. *Katabhi* (*Albizia lucida*)
14. *Tapasa Vriksha* (*Balanites aegetpiaca*)

Doshakarma: Kaphahara

Indications: *Medoroga, Visha, Krimi, Kushta* and *Vrana*

23. Surasadi Gana

सुरसयुग्मफणिज्जं कालमाला विडङ्गंखरवुसवृषकर्णीकिट्फलं कासमर्दः ।
क्षवक सरसिभार्ङ्गीकार्मुकाः काकमाचीकुलहल विषमुष्टीभूस्तृणी भूतकेशी ॥
सुरसादिर्गणः श्लेष्ममेदः कृमिनिषूदनः । प्रतिश्यायारुचिश्वासकासघ्नो व्रणशोधनः ॥

अ. हृ. सू. 15/30-31

1. *Shwetatulasi* (*Ocimum sanctum*)
2. *Krishnatulasi* (*Ocimum sanctum*)
3. *Phanijja* (*Piper nigrum*)
4. *Kalamala* (*Ocimum basilicum*)
5. *Vidanga* (*Embelia ribes*)
6. *Kharavusa* (*Thymus serpyllum*)
7. *Vrishakarni* (*Ipomoea reniformis*)
8. *Katphala* (*Myrica nagi*)
9. *Kasamarda* (*Casia occidentalis*)
10. *Kshavaka* (*Centipeda minima*)
11. *Sarasi* (*Zanthoxylum armatum*)
12. *Bharangi* (*Clerodendron serratum*)
13. *Karmuka* (*Peristrophe bicalyculata*)
14. *Kakamachi* (*Solanum nigrum*)
15. *Kulahala* (Bhūkadamba - *Spaeranthes indicus*)
16. *Vishamushti* (*Melia azadirachta*)
17. *Bhustrana* (*Hyptis suaveolens*)
18. *Bhutakeshi* (*Nardostachys Jatamsnsi*)

Doshakarma: Kaphahara

Indications: *Medoroga, Krimi, Pratishyaya, Aruchi, Shwasa, Kasa* and *Vrina.*

24. Mushkakadi Gana

मुष्ककस्नुग्वरद्वीपिपलाशधवशिंशिपाः । गुल्ममेहाश्मरीपाण्डुमेदोर्शः कफशुक्रजित् ॥

अ. हृ. सू. 15/32

1. *Mushkaka* (*Schrebera swietenioides*)
2. *Snuk* (*Euphorbia nerifolia*)
3. *Vara* (*Holarrehna antidysentenca - Varatikta*)
4. *Dwipi* (*Plumbago zeylanica*)
5. *Palasha* (*Butea monosperma*)
6. *Dhava* (*Anogeissus letifolia*)
7. *Shimshipa* (*Dalbergia sissoo*)

Doshakarma: Kaphahara

Indications: *Gulma, Meha, Ashmari, Pandu, Arshas* and *Shukradosha.*

25. Vatsakadi Gana

वत्सकमूर्वा भार्ङ्गीकटुकामरिचंघुणप्रिया च गण्डीरम् ।
एला पाङ्गाऽजाजीकट्वङ्गफलाजमोदसिद्धार्थवचाः ॥
जीरकहिङ्गुविडङ्गं पशुगन्धा पञ्चकोलकं हन्ति ।
चलकफमेहः पीनसगुल्मज्वरशूल दुर्नामघ्नः ॥ अ. हृ. सू. 15/33-34

1. *Vatsaka* (*Holarrhena antidysenterica*)
2. *Murva* (*Marsedenia tenacissima*)
3. *Bharngi* (*Clerodendron serratum*)
4. *Katuka* (*Picrorrhiza kurroa*)
5. *Marica* (*Piper nigrum*)
6. *Ghunapriya* (*Aconitum heterophyllum*)
7. *Gandira* (*Euphorbia nerifolia*)
8. *Ela* (*Elattaria cardamomum*)
9. *Patha* (*Cissampelos pareira*)
10. *Ajaji* (*Cuminum cyminum*)
11. *Katvangaphala* (*Ailanthes excelsa* fruit)
12. *Ajamoda* (*Apium graveolens*)
13. *Siddhartha* (*Brassica campestris*)
14. *Vacha* (*Acorus calamus*)
15. *Jiraka* (*Carum carvi*)
16. *Hingu* (*Ferula narthex*)
17. *Vidanga* (*Embelia ribes*)
18. *Pashaugandha* (*Gynandropis gynandra*)
19. *Pippali* (*Piper longum*)
20. *Pippalimula* (Root of *Piper longum*)
21. *Chavya* (*Piper chaba*)
22. *Chitraka* (*Plumbago zeylanica*)
23. *Nagara* (*Zingiber officinale*)

Doshakarma: Kaphahara

Indications: *Pinasa, Gulma, Jwara, Shula* and *Arshas*

26. Vachadi Gana

वचाजलददेवाह्वनागरातिविषाभयाः । हरिद्राद्वययष्ठ्याह्वकलशीकुटजोद्भवाः ॥
वचाहरिद्रादिगणवामातीसारनाशनौ । मेदःकफाढ्यपवनस्तन्यदोषनिबर्हणौ ॥
अ. हृ. सू. 15/35-36

1. *Vacha* (*Acorus calamus*)
2. *Jalada* (*Cyprus rotundus*)
3. *Devahwa* (*Cedrus deodara*)
4. *Nagara* (*Zingiber officinale*)
5. *Ativisha* (*Aconitum heterophyllum*)
6. *Abhaya* (*Terminalia chebula*)
7. *Haridra* (*Curcuma longa*)
8. *Daruharidra* (*Berberis aristata*)
9. *Yashti* (*Glycyrrhiza glabra*)
10. *Kalashi* (*Uraria picta*)
11. *Kutajodhbhava* (Seeds of *Holarrhena antidysenterica*)

Doshakarma: Kaphavatahara

Indications: *Amatisara, Medoroga* and *Stanyadosha.*

27. Priyangvadi Gana

प्रियङ्गुपुष्पाञ्जनयुग्मपद्माः पद्माद्रजोयोजनवल्लयनन्ता ।
मानद्रुमो मोचरसः समङ्गा पुन्नागशीतं मदनीयहेतुः ॥ अ. हृ. सू. 15/37-39

1. *Priyangu* (*Callicarpa macrophylla*)
2. *Srotonjana* (Collyrium)
3. *Sauviranjana* (Collyrium)
4. *Padma* (*Nelumbium speciosum*)
5. *Padmakeshara* (*Nelumbo nucifera*)
6. *Yojanavalli* (*Rubia cordifolia*)
7. *Ananta* (*Fagonia critica*)
8. *Manadruma* (*Salmalia malabarica*)
9. *Mocharasa* (*Niryāsa* of *Salmalia malabarica*)
10. *Samanga* (*Mimosa pudica*)
11. *Punnaga* (*Callophyllum inophyllum*)
12. *Shita* (*Santalum album*)
13. *Madaniya Hetu* (*Woodfordia fruticosa*)

28. Ambashthadi Gana

अम्बष्ठा मधुकं नमस्कारीनन्दीवृक्षपलाशकच्छुराः ।
रोध्रं धातकी बिल्वपेशिके कट्वङ्गः कमलोद्भवं रजः ॥
गणौ प्रियङ्ग्वम्बष्ठादी पवह्वातीसारनाशनौ । सन्धानीयौहितौ पित्ते व्रणानामापि रोपणौ ॥
अ. हृ. सू. 15/37-39

1. *Ambashtha* (*Cissampelos pareira*)
2. *Madhuka* (*Glycyrrhiza glabra*)
3. *Namaskari* (*Mimosa pudica*)
4. *Nandivriksha* (*Ficus rumphii*)
5. *Palasha* (*Butea monosperma*)
6. *Kacchura* (*Fagonia critica*)
7. *Rodhra* (*Symplocos racemosa*)
8. *Dhataki* (*Woodfordia fruticosa*)
9. *Bilvapeshika* (Pulp of *Aegle marmelos*)
10. *Katvanga* (*Oroxylum indicum*)
11. *Kamalodbhava raja* (*Nelumbo nucifera*)

Both *Priyangvadi* & *Ambashthadi Gana* are having same properties.

Doshakarma: Pittahara

Indications: *Pakwatisara and Vrana*

29. Mustadi Gana

मुस्तावचाग्निद्विनिशाद्वितिक्ताभल्लातपाठात्रिफला विषाख्याः ।
कुष्ठं त्रुटी हैमवती च योनिस्तन्यामयघ्ना मलपाचनाश्च ॥ अ. हृ. सू. 15/40

1. *Musta* (*Cyperus rotundus*)
2. *Vacha* (*Acorus calamus*)
3. *Agni* (*Plumbago zeylanica*)
4. *Haridra* (*Curcuma longa*)
5. *Daruharidra* (*Berberis aristata*)
6. *Katuka* (*Pincrorrhiza kurroa*)
7. *Kakatikta* (*Karanja - Pongamia pinnata*)
8. *Bhallata* (*Semecarpus anacardium*)
9. *Patha* (*Cissampelos pareira*)
10. *Amalaki* (*Emblica officinalis*)
11. *Haritaki* (*Terminalia chebula*)
12. *Vibhitaki* (*Terminalia belerica*)
13. *Visha* (*Aconitum ferox*)
14. *Kushtha* (*Saussurea lappa*)
15. *Truti* (*Elattaria cardamomum*)
16. *Haimavati* (*Iris germanica*)

Properties: *Yonidoshahara, Stanyamayaghna* and *Malapachana.*

30. Nyagrodhadi Gana

न्यग्रोधपिप्पलसदाफलरोध्रयुग्मंजम्बुद्वयार्जुनकपीतनसोमवल्काः ।
प्लक्षाम्रवञ्जुलप्रियालपलाशनन्दीकोलीकदम्बविरला मधुकं मधूकम् ॥
न्यग्रोधादिर्गणो द्रव्यः संग्राही भग्नसाधनः । मेदःपित्तास्त्रतृड् दाहयोनिरोग निबर्हणः ॥

अ. हृ. सू. 15/41-42

1. *Nyagrodha (Ficus benghalensis)*
2. *Pippala (Ficus religiosa)*
3. *Sadaphala (Ficus racemosa)*
4. *Rajajambu (Eugenia jambolana)*
5. *Kakajambu (Eugenia operculata)*
6. *Rodhra (Symplocos racemosa)*
7. *Sabararodhra (Symplocos crategoides)*
8. *Arjuna (Terminalia arjuna)*
9. *Kapitana (Spondias mangifera)*
10. *Somavalka (Myrica nagi)*
11. *Plaksha (Ficus lacor)*
12. *Amra (Mangifera indica)*
13. *Vanjula (Salix caprea)*
14. *Priyala (Buchanania lanzan)*
15. *Palasha (Butea monosperma)*
16. *Nandi (Ficus rumphi)*
17. *Koli (Zizyphus jujuba)*
18. *Kadamba (Anthocephalus cadamba)*
19. *Virala (Diospyros melanoxylon)*
20. *Madhuka (Glycyrrhiza glabra)*
21. *Madhuka (Madhuca indica)*

Doshakarma: Pittahara

Indications: *Vrana, Bhagna, Pittasra, Trt, Daha* and *Yoniroga.*

31. Eladi Gana

एलायुग्मतुरुष्ककुष्ठफलिनीमांसीजलध्यामकंस्पृवहकाचोरकचोचपत्रतगरस्थौणेयजतिरसाः ।
शुक्तिर्व्याघ्रनखोऽमराह्वमगुरुः श्रीवासकः कुङ्कुमं चण्डागुग्गुलुदेवधूपखपुराः पुन्नाग नागाह्वयम् ॥

एलादिको वातकफौ विषं च विनियच्छति । वर्णप्रसादनः कण्ठपिटिकाकोठनाशनः ॥

अ. हृ. सू. 15/43-44

1. *Ela (Elattaria cardamomum)*
2. *Sthulaila (Ammomum subulatum)*
3. *Turushka (Liquidamber orientalia)*
4. *Kushtha (Saussurea lappa)*
5. *Phalini (Callicarpa macrophylla)*
6. *Mamsi (Nardostachys jatamansi)*
7. *Jalam (Pavonia odorata)*
8. *Dhyamaka (Cymbopogon citratus)*
9. *Sprakka (Delphinium zalil)*
10. *Choraka (Angelica glauca)*
11. *Chocha (Cinnamomum zeylanica)*
12. *Patra (Cinnamomum tamala)*
13. *Tagara (Valeriana wallichi)*
14. *Sthouneyaka (Taxus baccata)*
15. *Jatirasa (Commiphora myrrh)*
16. *Shukti (Zizyphus mauritiana)*
17. *Vyaghranakha (Capparis seperia)*
18. *Amarahwa (Cedrus deodara)*
19. *Agaru (Aquillaria agalocha)*
20. *Shrivshtaka (Pinus roxburghi)*
21. *Kumkuma (Crocus sativus)*
22. *Chanda (Angelica archangelica)*
23. *Guggulu (Commniphora mukul)*
24. *Devadhupa (Vateria indica)*
25. *Khapura (Boswellia serrata)*
26. *Punnaga (Calophyllum inophyllum)*
27. *Nagahwa (Mesua ferrea)*

Doshakarma: Vatakaphahara

Indications: *Visha, Vaivarnya, Kandu* and *Kota.*

32. Shyamadi Gana

श्यामादन्तीद्रवन्तीक्रमुककुटरणाशङ्खिनीचर्मसाह्वास्वर्णक्षीरीगवाक्षीशिखारिरजनकच्छिन्न-

रोहाकरञ्जाः । बस्तान्त्री व्याधिघातोबहलबहुरसस्तीक्ष्णवृक्षात् फलानि श्यामाद्यो हन्ति गुल्म विषमरुचिकफौहृद्रुजं मूत्रकृच्छ्रम् ॥ अ. हृ. सू. 15/45

1. *Shyama* (*Operculina turpethum*)
2. *Danti* (*Baliospermum montanum*)
3. *Dravanti* (*Croton tiglium*)
4. *Kramuka* (*Pattikarodhra - Vibrum nervosum*)
5. *Kutarana* (*Shwetatrivrt - Ipomoea turpethum*)
6. *Shankhini* (*Euphorbia dracunculoides*)
7. *Charmasahva* (*Satala - Euphorbia pilosa*)
8. *Swarnakshiri* (*Garcnia morella - Euphorbia thomsoniana*)
9. *Gavakshi* (*Citrullus colocynthis*)
10. *Shikhari* (*Achyranthes aspera*)
11. *Rajanaka* (*Mallotus philippinensis*)
12. *Chinnaruha* (*Tinospora cordifolia*)
13. *Karanja* (*Pongamia pinnata*)
14. *Bastantri* (Vrddhādōruka - *Argeria speciosa*)
15. *Vyadhighata* (*Cassia fistula*)
16. *Bahala* (*Moringa oleifera*)
17. *Bahurasa* (*Saccharum officinarum*)
18. *Tikshnavraksha* (*Salvadora persica*)

Doshakarma: Kaphahara

Indications: *Gulma, Visha, Aruchi, Hrdruja* and *Mutrakricchra.*

Exercises: Multiple Choice Questions (MCQ)

1. The Mahabhuta in a Dravya which becomes Adhishthana is

   a. Ap b. Vayu c. Prithvi d. Agni

   Ans: c. Prithvi

2. The Mahabhuta which forms Yoni in a Dravya

   a. Prithvi b. Jala c. Agni d. Vayu

   Ans: b. Jala

3. Ushna, Tikshna, Sukshma, Laghu, Ruksha Gunas are present in which Mahabhuta Pradhana Dravya?

   a. Ap b. Prithvi c. Akasha d. Agni

   Ans: d. Agni

4. The plants which will not have visible flowers are called
   a. Virudha b. Vanaspati c. Vaanaspatya d. Oushadhi
   Ans: b. Vanaspati
5. Vata, Udumbara and Plaksha are the examples for
   a. Vanaspati b. Virudha c. Vaanaspatya d. Oushadhi
   Ans: Vanaspati
6. Lata and Gulma are included under
   a. Vanaspati b. Virudha c. Vaanaspatya d. Oushadhi
   Ans: Virudha
7. Amra and Jambu are given as examples for
   a. Vanaspati b. Virudha c. Vaanaspatya d. Oushadhi
   Ans: c. Vaanaspatya
8. Plants which bear visible flowers are known as
   a. Vanaspati b. Virudha c. Vaanaspatya d. Oushadhi
   Ans: c. Vaanaspatya
9. Plants which becomes dry and end its life by giving fruits are called
   a. Vanaspati b. Virudha c. Vaanaspatya d. Oushadhi
   Ans: d. Oushadhi
10. Types of Dravya mentioned on the basis of source (Yoni) as per Charaka
    a. 2 b. 3 c. 4 d. 5
    Ans: b. 3
11. Amalaki is given as example for which type of Virya in the classification of Dravya based on Prayoga
    a. Tikshna Virya b. Madhya Virya c. Mradu Virya d. Ushna Virya
    Ans: c. Mradu Virya
12. Dhatu Pradushana will come under which type of classification of Dravya
    a. Utpatti b. Yoni c. Prayoga d. Prabhava
    Ans: d. Prabhava
13. Swasthahita Dravya is a type of classification mentioned under
    a. Yoni Bheda b. Prayoga Bheda c. Prabhava Bheda d. Utpatti Bheda
    Ans: c. Prabhava Bheda
14. Vata Samshamana Dravya will have
    a. Ruksha Shita Laghu Guna b. Snigdha Ushna Guru Guna
    c. Ruksha Shita Chala d. Ruksha Shita Khara
    Ans: b. Snigdha Ushna Guru guna

15. Lohita Shali, Mudga and Antariksha Jala are the examples for
    a. Kopana dravya b. Shamana Dravya c. Swasthahita d. Katu Skandha
    Ans: c. Swasthahita
16. Amra, Amrataka and Lakucha are mentioned in which Skandha
    a. Madhura b. Katu c. Kashaya d. Amla
    Ans: d. Amla
17. Pippali, Pippalimula and Shringavera are mentioned in which Skandha as per Charaka
    a. Amla b. Lavana c. Katu d. Tikta
    Ans: Katu
18. Types of Dravyas according to Yoni Bheda as per Sushruta
    a. 3 b. 2 c. 4 d. 5
    Ans: b. 2
19. 4 types of Sthavara Dravya as per Sushruta
    a. Vanaspati, Vriksha, Virudha and Oushadha
    b. Vanaspati, Vaanaspatya, Virudha & Oushadha
    c. Vanaspati, Vriksha, Vaanaspatya and Oushadha
    d. Vaanaspatya, Vriksha, Virudha and Oushadha
    Ans: a. Vanaspati, Vriksha, Virudha and Oushadha
20. Types of Jangama Dravya
    a. 6 b. 5 c. 4 d. 3
    Ans: c.4
21. Chaturvidha Jangama Dravyas are
    a. Jarayuja, Andaja, Swedaja, Udbhija
    b. Jarayuja, Andaja, Swedaja, Sthavara
    c. Jarayuja, Anupaja, Swedaja, Andaja
    d. Jarayuja, Swedaja, Jangala, Andaja
    Ans: a. Jarayuja, Andaja, Swedaja, Udbhija
22. Kshira, Ghrata, Shali are included underwhich Skandha
    a. Lavana b. Katu c. Madhura d. Tikta
    Ans: c. Madhura
23. Tila and Durva are the examples for
    a. Vanaspati b. Oushadhi c. Vaanaspatya d. Virudha
    Ans: b. Oushadhi

24. Shilajatu and Gairika are the examples for
    a. Jangama b. Oudbhida c. Sthavara d. Vanaspati
    Ans: c. Sthavara
25. Kshara, Phala, Pushpa and Kanda are included under
    a. Andaja b. Oudbhida c. Jangama Gana d. Jarayuja
    Ans: b. Oudbhida

****

3 Chapter

Guna Vijnana

Contents

- *Guna Lakshana* (Characteristic features of *Guna*)
- *Guna Sankhya* (Number of Gunas)
- *Guna Vibhajana* (Classification of *Guna*)
- *Gurvadi Guna*, research updates and clinical application
- *Paradi Guna*, research updates and clinical application
- Research Updates

1. *Guna Lakshana* (Characteristic Features of *Guna*)

समवायि तु निश्चेष्ट कारणं गुणः । च. सू. 1/51

चक्रपाणि भाष्य-समवायीति समवायाधेयः । गुणः समवायी द्रव्यसमवायी । द्रव्यसमवायान् गुणः कारणं भवति । समवायि कारणं द्रव्यमपीत्यत आह निश्चेष्टस्त्विति । तुकारो द्रव्याद् व्यवच्छिनत्ति । नास्ति चेष्टा यस्य स निश्चेष्टः निष्क्रियः ।

द्रव्यं गुणकर्माश्रयः, गुणस्तु गुणकर्मावाश्रय इति द्रव्यतो भेदः । योगेन्द्रनाथ सेन

द्रव्याश्रय गुणवान् संयोग-विभागेश्वकारणमनपेक्ष इति गुणलक्षणम् । वै. द. अ. 1/सू. 16

अथ द्रव्याश्रिता ज्ञेया निर्गुणा निष्क्रिया गुणाः । कारिकावलि गुणग्रन्थः

Guna is defined as the entity which resides in the *Dravya* in an inherent relation. *Guna* itself is inactive i.e. does not perform any action independent of *Dravya* and does not shelter any *Guna.*

In other words, *Guna* has an inherent relation *(Samavaya Sambandha)* with *Dravya* and has a non-inherent relation (*Asamavaya Samabandha*) with *Karma.*

Dravya	Guna	Karma
Shelters *Guna Karma* etc.	Does not shelter *Guna Karma* Does not perform *Karma* independently	*Karana* for *Samyoga* & *Vibhaga*

विश्व लक्षणाः गुणाः । र. वै. अ. 1/सू. 168

विश्वं विकीर्णं भिन्नं लक्षणं येषां ते विश्वलक्षणा गुणाः । इदमत्रोक्तं भवति-शेषाणां पञ्चानां (द्रव्य-रस-वीर्य-विपाक-कर्मणां) पदार्थानामेकलक्षणावरोधो विद्यते, यथा-शब्दादीनामाश्रयत्वं सर्वद्रव्यभेदानां तुल्यम्, आस्वादग्राह्यावरोधश्च रसभेदानां, कर्म लक्षणावरोधत्वं वीर्याणां, विपाकयोश्च

परिणामलक्षणावरोधस्तुल्यः गुणानामेवमेकलक्षणावरोधो नास्त्रि । यथा-शीतोष्णादयः स्पर्शेन्द्रियच्च्य ग्राृाः, स्निग्ध-रुक्षौ चक्षुर्ग्राौ स्पर्शेनेन्द्रियग्राौवा, एवं सर्वे एकलक्षणावरोधं न गच्छन्ति गुणाः । यस्मादेवमेकलक्षणावरोधं व गच्छन्ति तस्मादेवैस्तेषां अतुल्यं विकीर्णलक्षणत्वमेव लक्षणमिति । भाष्य

One whose characteristics are varied and vast is *Guna.* This is because, each of the other *Padarthas* has distinct characteristics and identifying features. Like, that which shelters the *Shabdadi* is *Dravya.* That entity which can be perceived through *Rasanendriya* or tongue is *Rasa. Virya* can be assessed through its actions and *Vipaka* by the change it undergoes. Whereas, due to its varied characteristics *Guna* is one entity/factor which is difficult to assess by a single parameter. Hence *Guna* is characterised by *Vishwa Lakshana.* In otherwords, *Vishwa Lakshana* i.e. varied nature of *Guna* is itself the *Lakshana* (Characteristic feature) of *Guna.*

2. *Guna Sankhya* (Number of *Gunas*)

सार्था गुर्वादयो बुद्धिः प्रयत्नान्ताः परादयः । गुणाः प्रोवहता................. । च. सू. 1/49

Charaka gives totally 41 *Gunas* under the following sub headings as:

Sl No	*Guna*	Number
1.	*Artha Guna*	5
2.	*Gurvadi Guna*	20
3.	*Buddhi prayatnanta (Adhyatmika)*	6
4.	*Paradi Guna* .	10
	Total	41

Chakrapani comments that these can be put under three broad headings as:

i) *Vaisheshika* - includes *Shabdadi Artha*	-	5
ii) *Samanya* - includes *Gurvadi & Paradi*	-	30
iii) *Atma Guna* - includes	-	6
Total		41

Note: Yogendranath Sen has added the 42nd *Guna* as *Mana,* because even this is considered to be a quality of *Atma* as per the *Shloka.*

मनो मनोऽर्थो बुद्धिरात्मा चेत्यध्यात्मद्रव्य गुण संग्रहः । च. सू. 8/13

Nagarjuna mentioned *Shitoshnadi Dasha* (10) *Karmanya Gunas.*

3. *Guna Vibhajana* (Classification of *Guna*)

Generally, all these 41 *Gunas* are classified as *Adhyatmika* and *Adibhautika.*

Thus, the entire classification of *Guna* can be represented in a flow chart as shown below.

Guna

- *Adhyatmika Guna* (6) (*Atma Guna*)
  - *Iccha*
  - *Dwesha*
  - *Sukha*
  - *Dukha*
  - *Buddhi*
  - *Prayatna*
- *Adibhautika Guna*
  - *Samanya*
    - *Gurvadi* (20) (*Sharirika Guna*)
      - *Guru & Laghu*
      - *Shita & Ushna*
      - *Snigdha & Ruksha*
      - *Manda & Tikshna*
      - *Sthira & Sara*
      - *Mradu & Kathina*
      - *Vishada & Picchila*
      - *Shlakshna & Khara*
      - *Sukshma & Sthula*
      - *Sandra & Drava*
    - *Paradi* (10) (*Cikitsopayogi Guna*)
      - *Para*
      - *Apara*
      - *Yukti*
      - *Sankhya*
      - *Samyoga*
      - *Vibhaga*
      - *Prathaktwa*
      - *Parimana*
      - *Samskara*
      - *Abhyasa*
  - *Vishesha* (s) (*Artha*)
    - *Shabda*
    - *Sparsha*
    - *Rupa*
    - *Rasa*
    - *Gandha*

Adhyatmika Guna (Atma Guna)

इच्छाद्वेषः सुखं दुःखं प्रयत्नश्चेतना धृति । बुद्धिः स्मृतिरहङ्कारो लिङ्गानि परमात्मनः ॥

च. शा. 1/72

The qualities of *Atma* are known as *Adhyatmika Guna.* These are 6 in number. *Cakrapani* in his commentary includes *Dhriti, Smrti, Ahankara & Chetana* under *Buddhi* itself. Thus, the *Adhyatmika Gunas* are *Iccha, Dwesha, Sukha, Dukha, Prayatna & Buddhi.*

Vishesha Guna (Artha)

अर्थाः शब्दादयो ज्ञेया गोचरा विषया गुणाः । च. शा. 1/31

चक्रपाणि भाष्य-तत्रार्थाः शब्द-स्पर्श-रूप-रस-गन्धाः ।

The *Pradhana Guna* of each *Mahabhuta* comes to be called as *Artha*. These are five in number and are known as *Vishesha* or *Vaisheshika Guna*. They are *Shabda, Sparsha, Rupa, Rasa* and *Gandha*.

Gurvadi Guna

स विंशति गुणाः-गुरु-लघु-शीत-उष्ण-स्निग्ध-रूक्ष-मन्द-तीक्ष्ण-स्थिर-सर-मृदु-कठिण-विशद-पिच्छिल-श्लक्ष्ण-खर-सूक्ष्म-स्थूल-सान्द्र-द्रवानुगमात् । च. सू. 25/36

गुरु-मन्द-हिम-स्निग्ध-श्लक्ष्ण-सान्द्र-मृदु-स्थिराः ।

गुणाः ससूक्ष्म-विशदा विंशतिः सविपर्ययाः ॥ अ. हृ. सू. 1/18

Gurvadi Gunas are also known as *Sharirika Gunas*. These are 20 In number; Guru, Laghu, Manda, *Tikshna, Hima, Ushna, Snigdha, Ruksha, Shlakshna, Khara, Sandra, Drava, Mradu, Kathina, Sthira, Sara, Sukshma, Sthula, Vishaada & Picchila.*

Paradi Guna

परापरत्वे युक्तिश्च संख्या संयोग एव च । विभागश्च पृथत्तहवं च परिमाणमथापि च ।
संस्कारोऽभ्यास इत्येते गुणा ज्ञेयाः परादयः ॥ च. सू. 26/29-30

These are also known as *Chikitsopayogi Guna* and are 10 in number, those are *Para, Apara, Yukti, Sankhya, Samyoga, Vibhaga, Prthaktwa, Parimana, Samskara & Abhyasa.*

4. *Gurvadi Guna*

गुणा या उक्ता द्रव्येषु शरीरेष्वपि ते तथा । सु. सू. 42/12

Gurvadi Gunas which are twenty in number are commonly found in *Sharira* as well as in *Dravya*. Hence, they are also known as *Sharirika Guna*.

Acharya Caraka and *Sushruta* described *Gurvadi GuNa* while discussing about *Ahara* and its *Sevana*.

There is slight variation in the enumeration of *Gunas* from different authors. Usually two *Gunas* whichh are antagonists to each other are grouped together. The following table shows variations in this combination as per different authors.

Vagbhata	Charaka	Sushruta	Nagarjuna	Bhavamishra
Ref. A.Hr. Su. 1/18	Ca. Su. 25/36	Su. Su. 46/518 Su. 111	Ra. Vai. A. &	B. Pr.
Guru x *Laghu*	*Guru* x *Laghu*	*Guru* x *Laghu*	*Guru* x *Laghu*	*Guru* x *Laghu*
Manda x *Tikshna*	*Manda* x *Tikshna*	*Mradu* x *Tikshna*	*Mradu* x *Tiksha*	*Manda* x *Tikshna*
Hima x *Ushna*	*Shita* x *Ushna*	*Shita* x *Ushna*	*Shita* x *Ushna*	*Shita* x *Ushna*

Snigdha x *Ruksha*	*Snigdha* x *Ruksha*	*Snigdha* x *Ruksha*	*Snigdha* x *Ruksha*	*Snigdha* x *Ruksha*
Slakshna x *Khara*	*Slakshna* x *Khara*	*Slakshna* x *Karkasha*	-	*Slakshna* x *Karkasha*
Sandra x *Drava*	*Sandra* x *Drava*	*Sandra* x *Drava*	-	*Shushka* x *Drava*
Mradu x *Kathina*	*Mradu* x *Kathina*	-	-	
Sthira x *Sara*	*Sthira* x *Sara*	*Manda* x *Sara*	-	*Sthira* x *Sara*
Sukshma x *Sthula*	*Sukshma* x *Sthula*	*Sukshma* x *Sthula*	-	*Sukshma* x *Sthula*
Vishada x *Picchila*	*Vishada* x *Picchila*	*Vishada* x *Picchila*	*Vishada* x *Picchila*	*Vishada* x *Picchila*
		Sugandha x *Durgandha*		

***Gurvadi Gunas* mentioned by Various Scholars**

A.Hr. & A.S.	*Charaka*	*Sushruta*	*Nagarjuna*	*Bhavamishra*
Guru	*Guru*	*Guru*	*Guru*	*Guru*
Laghu	*Laghu*	*Laghu*	*Laghu*	*Laghu*
Manda	*Manda*	*Manda*	-	*Manda*
Tikshna	*Tikshna*	*Tikshna*	*Tikshna*	*Tikshna*
Hima	*Shita*	*Shita*	*Shita*	*Shita*
Ushna	*Ushna*	*Ushna*	*Ushna*	*Ushna*
Snigdha	*Snigdha*	*Snigdha*	*Snigdha*	*Snigdha*
Ruksha	*Ruksha*	*Ruksha*	*Ruksha*	*Ruksha*
Slakshna	*Slakshna*	*Slakshna*	-	*Slakshna*
Khara	*Khara*	-	-	-
Sandra	*Sandra*	*Sandra*	-	-
Drava	*Drava*	*Drava*	-	*Drava*
Mradu	*Mradu*	*Mradu*	*Mradu*	*Mradu*
Kathina	*Kathina*	-	-	-
Sthira	*Sthira*	-	-	*Sthira*
Sara	*Sara*	*Sara*	-	*Sara*
Sukshma	*Sukshma*	*Sukshma*	-	*Sukshma*

Sthula	*Sthula*	*Sthula*	-	*Sthula*
Vishada	*Vishada*	*Vishada*	*Vishada*	*Vishada*
Picchila	*Picchila*	*Picchila*	*Picchila*	*Picchila*
-	-	*Karkasha*	-	-
-	-	*Sugandha-*	-	-
-	-	*Durgandha*	-	-
-	-	*Vyavayi*	-	-
-	-	*Vikasi*	-	-
-	-	*Ashukari*	-	*Ashu*

The following observations can be drawn from the above two tables:

1. *Caraka* and *Vagabhata* have no difference of opinion regarding enlisting the 20 *Gurvadi Guna.*
2. *Sushruta* describes *Gunas* in the following manners;

i) First lists 5 *Gunas* with their antagonists, *Shita* x *Ushna, Snigdha* x *Ruksha, Picchila* x *Vishada, Tikshna* x *Mradu* & *Guru* x *Laghu.*

ii) Later continues to list 13 *Gunas,* they are *Drava, Sandra, Sthula, Shlakshna, Karkasha, Sugandha, Durgandha, Sara, Manda, Vyavayi, Vikasi, Sukshma* & *Ashukari.*

3. Extra *Gunas* referred by *Sushruta* are:
   Karkasha, Durgandha, Sugandha, Vyavayi, Vikasi & *Ashukari.*
4. *Sushruta* varies from *Caraka's* version:

Caraka	*Sushruta*
Manda x *Tikshna*	*Mradu* x *Tikshna*
Sthira x *Sara*	*Manda* x *Sara*

5. *Gunas* left by *Sushruta* are *Kathina, Khara* & *Sthira.*

Though extra *Gunas* are described under *Gurvadi Gunas,* commentator *Hemadri,* is of the opinion that these extra *Gunas* enlisted can be included under the 20 *Gurvadi* itself & proposes the following:

1. *Vyavayi*	-	included under *Drava* आ. र. on अ.हृ.सू. 1/18
2. *Vikasi*	-	in *Khara*
3. *Ashukari*	-	within *Chala*
4. *Sugandha*	-	under *Manda*
5. *Durgandha*	-	under *Tikshna*

Guru-Laghu

	Guru	*Laghu*
English	Heaviness	Lightness
Definition	The quality responsible for gravity or heaviness	The quality responsible for lightness
Nirukti	(पु) गृ-गिरणे गृ-शब्दे कर्तरि, गीर्य्यते स्तूयते वा कर्मणि या कुउच्च । (वाचस्पति)	(न) लधि–कुं नि नलोपः । (वाचस्पति)
Bhoutika Sanghatana	*Prithvi + Ap*	*Agni + Vāyu + Akāśa*
Karma: Dosha *Dhatu* *Mala* *Anya*	*Vatahara & Kaphakara* *Dhatu Vriddhi* *Mala Vriddhi* *BrhmaNa* *Sada* *Upalepa* *Balakrit* *TarpaNa* *Pushtikrit* *Cirapaki*	*Vatakara & Kaphahara* *Dhatu Kshaya* *Mala Kshaya* *Langhana* *Pathya* *Anupalepa* *Lekhana* *RopaNa* *Shighrapaki*
Examples	*Masha, Aragwadha & Shatavari*	*Mudga, Dadima & Patola*
Classical References	गुरुत्वं जलभूम्योः पतनकारणम् । (प्र.पा.भा.) गौरवं पार्थिवमाप्यञ्च । (र.वै.3/116) सादोपलेप बलकृत् गुरुस्तर्पण बृंहणः । (सु.सू. 46/518) गुरुर्वातहरः पुष्टिश्लेष्मकृत् चिरपाकी च । (भा.प्र. 6/203) यस्य द्रव्यस्य बृंहणे कर्मणि शक्तिः स गुरुः । (हेमाद्रि-अ.हृ.सू. 1/18)	लघुस्तद्विपरीतः । (प्र.पा.भा.) लाघवमन्यदीयम् । (र.वै.3/116) लघुस्तद्विपरीतस्याल्लेखना रोपणस्तथा । (सु.सू.46/519) लघु पथ्यं परं प्रोक्तं कफघ्नं शीघ्रपाकी च । (भा.प्र.6/203) यस्य द्रव्यस्य लङ्घने कर्मणि शक्तिः स लघुः । (हेमाद्रि-अ.हृ.सू.1/18)
Clinical application	*Guru Guna Dravyas* are very useful in *Vata Vyadhi*	*Laghu Guna Dravyas* are useful in *Kaphaja Vyadhi*

Shita–Ushna

	Shita	*Ushna*
English	Cold	Hot
Definition	Property which reduces temperature or imparts coldness	Property which increases temperature or imparts heat

Nirukti	(न) इयै-क्त स्पर्शे सम्म्र । (वाचस्पति)	(पु) उष + नक् ।
Bhoutika Sanghatana	*Ap + Vayu*	*Agni + Vayu*
Karma: Dosha *Dhatu* *Mala* *Anya*	*Pittahara, Vatakapha Kara* *Dhatu Vriddhi* *Mutrala, Swedapurisha Sthambhaka* *Sthambhana* *Hladana* *Murcha Trit, Sweda, Daha* - Useful in these conditions	*Pittakara, Vatakaphahara* *Dhatu Kshaya* *Pravartaka* *Swedana* *Pacana* (*Vrinadinam Pachanam*)
Examples	*Candana,Ushira,Manjishta*	*Citraka, Bhallataka*
Classical References	ह्लादनः स्तम्भनः शीतो मूर्च्छा तृट्स्वेद दाहजित् । (सु.सू.46/515) शीतस्तु ह्लादनः स्तम्भी मूर्च्छातृटस्वेद-दाहनुत् । (भा.प्र.6/208) यस्य द्रव्यस्य स्तम्भने कर्मणि शक्तिः स शीतः । (हेमाद्रि-अ.हृ.सू.1/18)	उष्णस्तद्विपरीतः स्यात् पाचनश्च विशेषतः । (सु.सू.46/515) उष्णो भवति विपरीतश्च पाचन । (भा.प्र.6/208) यस्य द्रव्यस्य स्वेदने कर्मणि शक्तिः स उष्णः । (हेमाद्रि-अ.हृ.सू.1/18)
Clinical application	*Shita Guna* is very useful in *Pittaja Vyadhi* and in case of *Daha, Mūrcha, & Atisweda, ShitaguNa Dravyas* are used.	*Ushna Guna* is helpful in *Vatakaphaja Vyadhi* and *Ajirna,* very necessary quality for *Swedana Karma*

Snigdha–Ruksha

	Snigdha	*Rūksha*
English	Oily/Unctuous/Viscid	Rough/Harsh/Dry
Definition	The property which instils or imparts oiliness	The quality which helps in drying
Nirukti	(त्रि) स्निह-वन स्नेहयुक्ते ।	(त्रि) रुह्-वहस-अचिवहकणे निःस्नेहे कठोरे। (वाचस्पति)
Bhoutika Sanghatana *Karma:* *Dosha* *Dhatu*	*Jala* (+ *Prithvi*) *Vatahara, Kaphakara* *Dhatu Vardhaka*	*Vayu* (+ *Agni*) *Kaphahara, Vatakara* *Dhatu Kshaya*

Mala *Anya*	*Malapravartaka, Loosens Mala* *Kledana* *Snehana* *Mardava* *Balya* *Varnya* *Vrishya*	*Mala Shoshaka & Sthambhaka* *Shoshana* *Stambhana* *KathiNyakara*
Examples	*Eranda, Devadaru*	*Apamarga, Vidanga*
Classical References	यस्य द्रव्यस्य वहलेदने कर्मणि शक्तिः स स्निग्धः । (हेमाद्रिं-अ.हृ.सू.1/18) स्नेहोमार्दवकृत् स्निग्धो बलवर्णकरस्तथा । (सु.सू.46/516) स्निग्धं वातहर श्लेष्मकारि वृष्यं बलावहम् । (भा.प्र.6/203)	यस्य द्रव्यस्य शोषणे कर्मणि शक्तिः स रूक्षः । (हेमाद्रि-अ.हृ.सू.1/18) रूक्षस्तद्विपरीतः स्याद्विशेषात् स्तम्भनः खरः। (सु.सू.46/516) रूक्षं समीरणंकरं परं कफहरं मतम् । (भा.प्र.6/203)
Clinical application	*Snigdha Guna* is very necessary for *Snehana Karma* and useful in *Vatavyadhi*	*Ruksha Guna* is very useful in *Atikleda* and for *Stambhana Karma.*

Manda–Tikshna

	Manda	*Tikshna*
English	Dull/Slow	Sharp
Definition	That which is responsible for slow activity.	The property responsible for sharpness or quickness
Nirukti	(त्रि) मदि-अच्-मृदौ अल्पे । (वाचस्पति)	(न) किस-क्स्त दीर्घश्च खरे स्पर्शे शीघ्रे । (वाचस्पति)
Bhoutika Sanghatana	*Prithvi + Jala*	*Agni (+ Vayu)*
Karma: *Dosha* *Dhatu* *Mala* *Anya*	 *Pittahara, Kaphakara* *Dhatu Vriddhikara* *Mala Apravartaka* *SHamana* *Yatrakara*	 *Pittakara, Kaphahara* *Dhatu Kshayakara* *Mala Pravartaka* *SHodhana* *Dahakara*

	Cirakari	*Pakakara* *SravaNa* *Lekhana*
Examples	*Guduci, Ativisha*	*Pippali, Bhallataka*
Classical References	यस्य द्रव्यस्य शमने कर्मणि शक्तिः स मन्दः । (हेमाद्रि-अ.हृ.सू.1/18) मन्दा यात्राकरः स्मृतः । (सु.सू.46/522) यात्राकरः इति वर्तनं करोति इति । (डल्हण भाष्य) मन्दः सकलकार्येषु शिथिलोऽअल्पोपि कथ्यते । (भा.प्र.6/211)	यस्य द्रव्यस्य शोधने कर्मणि शक्तिः स तीक्ष्णः । (हेमाद्रि-अ.हृ.सू.1/18) दाहपाककरस्तीक्ष्णः स्रावणाम् । (सु.सू.46/518) तीक्ष्णंपित्तकरं प्रायो लेखन कफ वातहृत् । (भा.प्र.6/204)
Clinical application	*Mandaguna Yukta Dravyas* are useful for *Dosha Shamana* in case of *Krsha* & *Durbala* persons andin *Alpa Dosha*	*Tikshna Guna* is very necessary for *Shodhana Karma* and useful in *Bahudosha*

Sthira–Sara

	Sthira	*Sara*
English	Firm/steady/fixed	Moving/motion
Definition	That which imparts firmness or steadiness	That which gives momentum
Nirukti	(पु) स्था-किरय् कठिने निश्चले । (वाचस्पति)	(न) सरति-सृ-अच् गमने । (वाचस्पति)
Bhoutika Sanghatana	*Prithvi*	*Jala* (*Su*) (+*Vayu*–P.V.S.)
Karma: *Dosha* *Dhatu* *Mala* *Anya*	 *Vatahara, Kaphakara* *Dhatu Vriddhi* *Bandhaka/Stambhaka* *DharaNa* *Vata Stambhi* *Mala Stambhi*	 *Vatakara* *Dhatu Kshaya* *Mala Pravartaka* *Prasarana* *Anulomana*
Examples	*Khadira,Babbula*	*Haritaki,Trivrita*

Classical References	यस्य द्रव्यस्य धारणे कर्मणि शक्तिः स स्थिरः । (हेमाद्रि-अ.हृ.सू. 1/18) स्थिरो वातमलस्तम्भी । (भा.प्र.6/207) Note: *Sushruta* does not mentioned *Sthira Guna*	यस्य द्रव्यस्य प्रसरणे कर्मणि शक्तिः स सरः । (हेमाद्रि-अ.हृ.सू.1/18) सरोऽनुलोमनो प्रोक्तो । (सु.सू.) अनुलोमनो वातमलप्रवर्तकः । (डल्हण भाष्य) सरस्तेषां प्रवर्तकः । (भा.प्र.6/207)
Clinical application	*Sthira Guna* is useful in *Stambhana Karma* and gives stability	*Sara GuNa* helps in *Anulomana Karma,* So very useful in *Malabadhata*

Note: *Suśruta* while describing *Pitriaja Bhava* says certain parts of body like *Keśa, Loma, Asthi, Danta, Dhamani, Reta* are produced out of *Pitraja Bhava. Hence* these can be manipulated by drugs having *Sthira GuNa*

Mridu–Kathina

	Mridu	*Kathina*
English	Soft	Hard/Stiff
Definition	That which imparts softness	That which results in hardening
Nirukti	(त्रि) मृद्-कु-कोमले । (वाचस्पति)	(त्रि) कठ-इनन् कठोरे । (वाचस्पति)
Bhoutika Sanghatana	*J ala + Akasha*	*Prithvi*
Karma:		
Dosha	*Kaphakara, Vatapittahara*	*Vatakara*
Dhatu	*Dhatu SHaithilyakara*	*Dhatu Dridhikarana*
Mala	*Softens-Mridukara*	*Hardens*
Anya	*Shlathane* (loosening/ relaxing) *Dahanashaka*	*Dridikarana Sanghatakara*
Examples	*Godhuma,Yashtimadu*	*Pravala,Shankha*
Classical References	यस्य द्रव्यस्य श्लथने कर्मणि शक्तिः स मृदुः। (हेमाद्रि-अ.हृ.सू.1/18) मार्दवं अन्तरिक्षभाष्यं च । (र.वै.3/113) शिथिलावयवत्वं मृदुत्वम् । (आ.द.3-2-31)	यस्य द्रव्यस्य दृढ़ीकरण शक्तिः स कठिणः। (हेमाद्रि-अ.हृ.सू. 1/18) तत्र द्रव्याणि कठिनणगुणबहुलानि पार्थिवानि । (च.सू.26) संघातोऽवयवानां काठिण्यम् । (आ.द.3-2-24)

Clinical application	*Mridu Guna* gives softness to the skin and hence useful in roug-hness and hardness of the skin.	*Katina Guna* impartshardness hence it givesstrength to the *Dhatus*

Note: *Sushruta* while describing *Matrja Bhavas* say that tissues which are *Mridu* in nature are formed out of *Matrija Bhava.* Hence one can utilise *Dravays* having *Mridu Guna* to influence these *Mridu* tissues in the body, like *Mamsa, Shonita, Meda, Majja, Yakrit, Pliha, Hridaya, Guda* etc.

Vishada–Picchila

	Vishada	*Picchila*
English	Clear/Pure/Clean/Spotless	Slimy/Lubricous/Slippery
Definition	That which clears or cleans	That which has a smearing effect
Nirukti	पु-वि+शद्-अच् शुभेप्वर्णे, विमले, व्यक्ते । (वाचस्पति)	'त्रि'–पिच्छ्-वा-इल स्निग्ध सृपाटौ पिच्छ+अस्त्यर्थे पिच्छा इलच् ।
Bhoutika Sanghatana	*Prithvi+Vayu+Agni+AkaSHa*	*Jala*
Karma: *Dosha* *Dhatu* *Mala* *Anya*	 *Vatakara, Kaphahara,* *Kshaya, Lekhana* *Mala Shoshaka* *Kshalana* *Kledacushana* *Ropana*	 *Kaphakara, Vatahara* *Dhatu Vriddhi, Brhmana* *Malotsarga* *Lepana* *Pranadharana* *Balya* *SandharaNa*
Examples	*Nimba Kshara Guggulu*	*Shleshmataka Shalamali*
Classical References	यस्य द्रव्यस्य क्षालने कर्मणि शक्तिः स विशदः । (हेमाद्रि-अ.हृ.सू.1/18) विशदे विपरीतोऽस्मात् वहलेदाचूषण रोपणः । (सु.सू.46/517) वहलेदच्छेदकरः ख्यातो विशदो व्रणरोपणः । (भा.प्र.6/208)	यस्य द्रव्यस्य लेपने कर्मणि शक्तिः स कठिणः । (हेमाद्रि-अ.हृ.सू.1/18) पिच्छिलो जीवनोबल्यः सन्धान श्लेष्मलो गुरुः । (सु.सू.46/517) पिच्छिलस्तन्तुलोबल्यः सन्धानः श्लेष्मलो गुरुः। (भा.प्र.6/207)
Clinical application	*Vishada* is very useful *Guna* in *Vrana* as it dries up the moisture.	*Picchila* is useful quality in *Bhagna* (Fracture) as it helps in joining.

Slakshna–Khara

	Slakshna	*Khara*
English	Smooth/Glossy/Polished	Hard/Rough
Definition	That quality which results in glossiness	That quality which results in roughness/coarse
Nirukti	(त्रि)–श्लिष-क्स्त नि चिवहकणे मनोहरे । (वाचस्पति)	(पु)–र खमिन्द्रियं लाति ला क वा रलयोरेकत्वम् । (वाचस्पति)
Bhoutika Sanghatana	*Akasha* (*Caraka*) *Agni* (*Rasa Vaisheshika*)	*Vayu+Prithvi* (*Caraka*) *Vayu+Agni*(*Su*), *Vayu*(*R.Vai*)
Karma: *Dosha* *Dhatu* *Mala* *Anya*	 *Kaphakara, Vatahara* *Dhatu Vardhaka* *Mala Pravartaka* *Ropana* Similar to *Picchila* i.e. *Jivana* *Balya* *Sandharana*	 *Vatakara* *Dhatu Kshaya* - *Lekhana*
Examples	*Vaikranta, Pravala, Mukta*	*Shukti*
Classical References	यस्य द्रव्यस्य रोपणे कर्मणि शक्तिः स श्लक्ष्णः । (हेमाद्रि-अ.हृ.सू.1/18) श्लक्ष्णः पिच्छिलवत् ज्ञेयः । (सु.सू.46/516) श्लक्ष्णः स्नेहं विनाऽपि स्यात्कठिणोऽपि हि चिवहकणः । (भा.प्र.6/206)	यस्य द्रव्यस्य लेखने कर्मणि शक्तिः स खरः । (हेमाद्रि-अ.हृ.सू.1/18) खरोऽमृदुः। (सं.(अ)-अ.हृ.सू.1) Note : *Sushruta* does not mention *Khara Guna* but refers to *Karkasha*
	श्लक्ष्णो अपरुषः । (सं(अ)-अ.हृसू. 1)	
Clinical application	*Shlakshna* is very necessary for the healing of ulcers.	*Khara Guna Yukta Dravyas* useful in *Sthoulya.*

Sukshma–Sthula

	Sukshma	*Sthula*
English	Subtle/Fine/Minute/ Acute/ Penetrating	Bulk/huge

Definition	That which penetrates or is very subtle	That which imparts bulk
Nirukti	(न)–सुच्-मनृ-सुवरच नेट् । अणुपरिमाणयुक्ते अल्पे । (वाचस्पति)	(त्रि)–अद्-चु-उभ-अक्-मेट् । बृंहणे । (वाचस्पति)
Bhoutika Sanghatana	*Agni+Vayu+AkaSHa*	*Prithvi*
Karma: *Dosha* *Dhatu* *Mala* *Anya*	 *Vatakara, Kaphahara* *Dhatu Kshaya* *Malakshayakara* *VivaraNe* (Open up channel) *Sukshma Chidreshu ViSHedya*	 *Vatahara, Kaphakara* *Dhatu Vrddhi* *Malotsarga* *Samvarane* (Conceds channels) *Sthoulyakara Dehe Srotasam Avarodha karaka*
Examples	*Madya Madhu*	*Dadhi Pishtaka*
Classical References	यस्य द्रव्यस्य विवरणे कर्मणि शक्तिः स सूक्ष्मः । (हेमाद्रि-अ.हृ.सू.1/18) सूक्ष्मास्तु सौक्ष्म्यात् सूक्ष्मेषु स्रोतःस्वनु सरः स्मृतः । (सु.सू.46/524) देहस्य सूक्ष्मछिद्रेषु विशेद्यत्सूक्ष्म मुच्यते । (भा.प्र.6/210)	यस्य द्रव्यस्य संवरणे कर्मणि शक्तिः स स्थूलः । (हेमाद्रि-अ.हृ.सू.1/18) Not mentioned by *SuSHruta* स्थूलः स्थौल्यकरो देहे स्रोतसाम वरोधकृत् । (भा.प्र.6/209)
Clinical application	*Sukshma Guna* is useful in *Vamana Karma* and the drug should have *Sukshma Guna* which enables the Dravya to penetrate.	*Sthula Guna* may be used in *Krasha* as it acts as *Brahmana*

Sandra–Drava

	Sandra	*Drava*
English	Compact/Dense	Fluid/Liquid
Definition	A quality which imparts comp-actness there by resulting in clearing the channels.	That which imparts fluidity or moisture to tissues.

Nirukti	(त्रि)–अदि ख् सह् अन्द्रेण ।(वाचस्पति)	(दु)–द्रु गतौ भावे अप् ।(वाचस्पति)
Bhoutika Sanghatana	*Prithvi*	*Jala*
Karma: *Dosha* *Dhatu* *Mala* *Anya*	 *Kaphakara, Vatahara* *Dhatu Upacaya* Compactness *Prasadana* *Bandhakaraka*	*Pittakara* *Dhatu Kshaya* Loosens *Vilodana* *Prakledana* *Syandanakaraka* *Vyapti*
Examples	*Mushali*	*Ikshurasa Kshira*
Classical References	यस्य द्रव्यस्य प्रसादने कर्मणि शक्तिः स सान्द्रः । (हेमाद्रि-अ.हृ.सू.1/18) सान्द्रः स्थान बन्धकारकः । (सु.सू.46/520) तत्र द्रव्याणि-सान्द्र-गुण बहुलानि पार्थिवानि । (च.सू.26/11)	यस्य द्रव्यस्य विलोडने कर्मणि शक्तिः स द्रवः । (हेमाद्रि-अ.हृ.सू.1/18) द्रवः प्रवहलेदनः परः । (सु.सू.46/520) द्रवः वहलेदकरो व्याधि । (भा.प्र.6/210)
	Note: *Bha. Misra* does not mention *Sandra,* but refers to *Sushka* as antagonist *to Drava.*	
Clinical application	*Sandra Guna* is *Kapha Vardhaka,* in case of *Krisha* it may be used to improve weight.	*Drava Guna* is very useful in case of constipation.

5. *Paradi Guna*

Acharya Charaka explains about ten special *Gunas* which are useful for treatment. These are called *Paradi Gunas.*

परापरत्वे युक्तिश्च संख्या संयोग एव च । विभागश्च पृथत्तहवं च परिमाणमथापि च ॥
संस्कारोऽभ्यास इत्येते गुणा ज्ञेयाः परादयः । सिद्ध्युपायाश्चिकित्साया लक्षणैस्तान् प्रयक्ष्महे ॥

च. सू. 26/29-30

Paradi Gunas are *Para, Apara, Yukti, Sankhya, Samyoga, Vibhaga, Prithaktwa, Parimana, Samskara* and *Abhyasa.*

1. Paratwa

The word *Paratwa* is derived from पृ-भावे अष्ट, कर्तरि अथवा meaning भिन्ने or उत्तरे ।

देश-काल-वयो-मान-पाक-वीर्य-रसादिषु । परापरत्वे................ । च. सू. 26/31

तच्च परत्वं प्रधानत्वम् । चक्रपाणि भाष्य

Para means *Pradhana* or that which is superior or best. In other terms that which is conducive for health comes to be called as *Para*. This favourability depends on various factors like *Desha, Vaya, Mana, Rasa, Virya, Vipaka, Prakruti, Bala* etc.

This property is explained in *Vaisheshika Darshana* and is suitably adapted to *Ayurveda*.

2. Aparatwa

The word *Apara* is derived from

(न)-न पूर्य्यते यतः पृ-अपादाने, अप् । वाचस्पति

अपरत्वं अप्रधानम् । चक्रपाणि भाष्य च. सू. 26/31

Apara is the factor which is inferior or worst. In *Chikitsa* point of view, it can be defined as those factors which are non-conducive for health.

Cakrapani further explains *Paratwa* & *Aparatwa* with suitable example.

तद्विवरणं देशकालेत्यादि । तत्र देशो मरुः परः, आनूपोऽपरः, कालो विसर्गः परः आदानमपरः वयःस्तरुणं परम्, अपरमितरत्; मानं च शरीरस्य यथा वक्ष्यमाणं शरीरे परं, ततोऽन्यदपरं, पाकवीर्यरसास्तु ये यस्य योगिनस्ते तं प्रति पराः अयौगिकास्त्वपराः आदिग्रहणात् प्रकृति बलादीनां ग्रहणम् । चक्रपाणि भाष्य च. सू. 26/29-30

Sl. No.	Factors	*Para*	*Apara*
1.	*Desha*	*Maru (Jangala)*	*Anupa*
2.	*Kala*	*Visarga*	*Adana*
3.	*Vaya*	*Taruna*	*Vraddha*
4.	*Mana*	*Prakruta Sharira Mana*	*Vikrata*
5.	*Paka-Virya-Rasa*	*Yougika* (In accordance)	*Ayaugika* (Not in accordance)
6.	*Prakruti*	Dissimilar to *Dosha Prakopa*	Similar to *Dosha Prakopa*
7.	*Bala*	*Pravara*	*Avara*

On observing these factors, it becomes clear that *Para* includes factors which are conducive for *Swasthya* or to cure a disease easily, whereas *Apara* includes factors which are not favourable or makes it difficult for treatment.

साध्योऽसाध्य इति व्याधिर्द्विधा, तौ तु पुनर्द्विधा । सुसाध्यः कृच्छ्रसाध्यश्च याप्यो यश्चानुपक्रमः ॥
सर्वौषध क्षमे देहे यूनः पुंसोजितात्मनः । अमर्मगोऽल्पहेत्वग्ररूप रूपोऽनुपद्रवः ॥
अतुल्यदूष्यदेशर्तु प्रकृतिः पादसंपदि । ग्रहेष्वनुगुणेष्वेकदोषमार्गो नवः सुखः ॥
अ. हृ. सू. 1/30-31

For example, if the patient is young, native of *Jangala Pradesha* has *Pravara Bala,* it becomes easier for treatment when compared to an old patient with *Avarabala* and of *Anupa Desha.*

Agrya Varga of *Charaka* enlists *Dravyas* which are the best in a particular category. This can be taken as *Para.*

Hitahara enlisted to finalise *Sadhyasadhyata* or *Vyadhis* can also be understood under this context.

3. Yukti

The word *Yukti* is derived from-

(aeer)-युज्-क्तिन् । वाचस्पति

युक्तिश्च योजना यातु युज्यते । च. सू. 26/31

Logical reasoning in using *Bheshaja* to prepare a formulation (*Samichina Kalpana*) is called *Yukti.*

अनेनोपदेशेन नानौषधिभूतं जगति किंचिद्रव्यमुपलभ्यते तां युक्तिमर्थं च तं तमभिप्रेत्य ।
च. सू. 26/12

Caraka says that all *Dravyas* in this universe are medicinal if used in accordance to *Yukti (Upaya)* and *Artha* (*Prayojana*).

Hence logical reasoning (*Yukti*) involves a thorough assessment of *Dosha, Dushya, Bala, Kala, Vaya, Prakruti* and other factors and selecting a *Bheshaja* suitable to the condition.

युक्तिश्चेत्यादौ योजना दोषाद्यपेक्षया भेषजस्य समीचीनकल्पना, अत एवोक्तंया तु युज्यते; या कल्पना यौगिकी भवति सा तु युक्तिरुच्यते, अयौगिकी तु कल्पनाऽपि सती युक्तिर्नोच्यते पुत्रोऽप्यपुत्रवत् । युक्तिश्चेयं संयोग परिमाण संस्काराद्यन्तर्गताऽप्युपयुक्तत्वात् पृथगुच्यते ।
चक्रपाणि भाष्य च. सू. 26/31

Cakrapani comments that a treatment without logical reasoning is a waste like a person having worthless son.

Though *Samyoga, Parimana* and *Samskara* comprehend *Yukti,* it is highlighted under *Paradi Guna* as it is very significant for a successful treatment.

The importance of *Yukti* can be further reiterated by *Charaka's* saying that

योगादपि विषं तीक्ष्णंमुत्तमं भेषजं भवेत् । भेषजं चापि दुर्युक्तं तीक्ष्णं सम्पद्यते विषम् ॥

च. सू. 1/126

Even a poison can be modified into a medicine through logic and a good medicine can become poisonous if used carelessly.

4. Sankhya

The word 'संख्या' is derived from-

(न) संख्यायतो परस्परनामोच्चारणं क्रियतेऽत्र सम् + ख्या-धञर्थे क । वाचस्पति

संख्या स्याद्गणिम् । च. सू. 26/32

गणितमिहैकद्वित्यादि । चक्रपाणि भाष्य च. सू. 26/32

'Samkhya' means *Ganita* denotes counting or calculation. Numbering is an essential part of *Ayurveda* as we have 3 *Dosha,* 7 *Dhatu,* 3 *Mala,* 5 *Mahabhuta,* 6 *Rasa,* 20 *Prameha* etc.

Apart from this, even for treatment *Samkhya* is very important. We have to decide the dosage, its frequency & duration which require correct calculations.

Also, for planning *Basti* treatment one needs to calculate the amount of *Kwatha, Taila* etc. to be prepared for a particular patient in a specific condition. This calls for mathematical estimations.

Hence *Samkhya* is a pre-requisite for successful treatment.

5. Samyoga

The word *Samyoga* is derived from-

(पु) सम् + युज-धञ । मेलनम् । वाचस्पति

योगः सह संयोग उच्यते । द्रव्याणां द्वन्द्वसर्वैककर्मजोऽनित्य एव च ॥ च. सू. 26/32

Union of two or more substances is called *Samyoga.*

Combinations are usually of two types as :

(i) *Nitya (Samavaya)*

(ii) *Anitya (Samyoga)*

The combination of *Dravya* and its inherent *Guna* are in an inherent relation or in *Nitya Sambandha* which is called *Samavaya.*

Combinations of two *Dravyas* in a temporary relation and is *Anitya,* which is called as *Samyoga.*

Caraka says *Samyoga* are of 3 types as:

सहेतिमिलितानां द्रव्यानां योगः प्राप्तिरित्यर्थ, सहेत्यनेनेहाकिंचित्करं परस्परसंयोगं निराकरेति। तद्भेदमाहद्वन्द्वेत्यादि। चक्रपाणि च. सू. 26/32

a) *Dwandwa Karmaja* b) *Sarva Karmaja* c) *Eka Karmaja*

a) Dwandwa Karmaja

तत्र द्वन्द्वकर्मजो यथा-युध्यमानयोर्मेषयोः। चक्रपाणि भाष्य च. सू. 26/32

Combinations of two *Dravyas* wherein both take part actively towards the effect.

Eg. Two *Meshas* (Sheep) fighting together.

Practical Application: Application of Kumari and *Haridra lepa* for skin diseases. Here both drugs act to combat the disease.

b) Sarvakarmaja

सर्वकर्मजो यथा-भाण्डे प्रक्षिप्यमाणानां माषाणां बहुल माषक्रिया योगजः।

चक्रपाणि भाष्य च. सू. 26/32

Combination of more than two *Dravyas* wherein all *Dravyas* work to produce the effect.

E.g. *Masha* (Blackgram) kept in a vessel which many in numbers, all will be converted into one particular preparation.

Practical Utility: *Trikatu Curna* in *Kasa*-Here all the three drugs i.e., *Marica (Piper nigrum), Pippali (Piper longum)* and *Shunthi (Zingiber officinale)* together help to mitigate *Kasa.*

c) Ekakarmaja

Combination of *Dravyas* where in only one remains active to produce the result is called *Ekakarmaja.*

E.g. A crow sits on the tree. Here 'crow' alone takes active part in Samyoga.

Practical Utility: *Eranda Patra* is tied over the knee with the help of a bandage cloth (Gauze) to treat *Shotha.* Here *Eranda Patra* and gauze come together, but it is only *Eranda* which relieves *Shotha.*

6. Vibhaga

The word *Vibhaga* is derived from

(पु)-वि + भञ्ज-भावे धञ्। वाचस्पति

विभागस्तु विभक्तिः स्याद्वियोगो भागशो ग्रहः। च. सू. 26/9

विभागमाह-विभागस्त्वित्यादि विभक्तिः विभञ्जनम् । विभक्तिमेव विवृणोति-वियोग इतिः संयोगस्य विगमो वियोगः । तत् किं संयोगाभाव राव वियोग इत्याह-भागशौ ग्रह इति । विभागशो विभक्तत्वेन ग्रहणं यतो भवतीति भावः; तेन विभक्तिरित्येषा भावरूपा प्रतीतिः, न संयोगाभावमात्रं भवति, कि तर्हि भावरूप विभागगुणयुक्ते इत्यर्थः । चक्रपाणि भाष्य च. सू. 26/33

Vibhaga is the opposite quality of *Samyoga*. Division of any combination is termed as *Vibhaga*. Like *Samyoga* this is also *Anitya*.

Vibhaga has 3 words.

(i) *Vibhakti* : Cutting the *Dravyas* into pieces to prepare any formulations.

E.g. Making coarse powder of *Kutaja (Holarrhena antidysenterica)* bark to prepare *Kutaja Kashaya*.

(ii) *Viyoga* : Two meanings may be derived from this term.

(a) Losing its original qualities, i.e. when one drug is not included in any formulation like *Hingwashtaka Churna,* the formulation may lose some qualities.

(b) Usage of substitutes: In case of non-availability of any drug using other drugs in its place.

E.g. Using *Shatavari(Asparagus racemosus)* in place of *Meda (Polygonatum cirrhafolium)* which is not available.

(iii) *Bhagasho Graha* : Considering only a small portion of a preparation is Bhagasho Graha. For Eg. While consuming *Rasayoga* making it into several divisions for proper therapeutic action.

7. Prathaktwa

The word *Prathaktwa* is derived from

पृथ.वा. कवि पृथक इत्यस्य भावः त्व भिन्न नाना रूपे (वाचस्पति)

पृथत्तहवं स्यादसंयोगो वैलक्ष्ण्यमनेकता । च. सू. 26/33

पृथकत्वं तु 'इदं द्रव्यं पटलक्षणं, घटात् पृथग्' इत्यादिका बुद्धिर्यतो भवति तत् पृथकत्वं भवति ।

चक्रपाणि भाष्य च. सू. 26/33

The uniqueness of substance by which it differentiates from others is called *Prathaktwa*.

Cakrapani comments saying that *Ghata* and *Pata* is different because of their unique qualities.

E.g. *Dhatura* is different from *Haritaki*.

Prathaktwa is of 3 types.

तच्चाचार्यस्त्रैविध्येनाह-पृथकत्वमित्यादि । च. सू. 26/33

(i) *Asamyoga* (ii) *Vailakshanya* (iii) *Anekata*

(i) *Asamyoga*

तत्र यत् सर्वथाऽसंयुज्यमानयोरिव मेकहिमाचलयोः पृथत्तहवम् । रातदसंयोग इत्यतेनोत्क्तम् ।

चक्रपाणि भाष्य च. सू. 26/33

The conspicuous differentiation between two substances which cannot be combined together is *Asamyoga*.

E.g. *Meru* & *Himalaya Parvata* cannot be brought together or combined. This clear distinction between the two is called *Asamyoga Prathaktwa*.

(ii) *Vailakshanya*

तथा संयुज्यमाना नपि पृथत्तहवं विजातीयानां महिषवराहादीना तदाह वैलक्षयमित्यादि । विशिष्टलक्षणयुक्तत्वलक्षितं विजातीयानां पृथत्तहवमित्यर्थः । चक्रपाणि भाष्य च. सू. 26/33

The differences between substance which belong to a single category but still are separate or different due to their distinct characters (*Visishta Lakshna*) is called *Vailakshanya Prathaktwa*.

E.g. 1. *Mahisha* (Buffallo) & *Varaha* (Pig). Both belong to the category of animals, but are different from each other (*Vijati*).

2. *Shatavari* and *Vaca* are herbal drugs. But each has clear characters to differentiate.

(iii) Anekata

तथैकजातीयानामप्यविलक्षणानां माषाणां पृथकत्वं भवतीत्याह अनेकतेति । एकजातीयेषु हि संयुक्तेषु न वैलक्ष्ण्य नाप्यसंयोगः अथ चानेकता पृथत्तहवरूपा भवतीति भावः ।

चक्रपाणि भाष्य च. सू. 26/33

Differences between substances of the same class are called *Anekata*.

E.g. 1. *Masha* grains belong to same *Jati* but each *Masha* grain varies from its size or colour.

2. Two types of *Tulasi* (*Ocimum sanctum*) belong to same *Jati* but both have differences based on the colour.

8. Parimana

The word *Parimana* is derived from

(न)-परिमीयतेऽनेन परि + मा-ल्युट् । वाचस्पति

परिमाणं पुनर्मानम् । च. सू. 26/34

मानं प्रस्थाढ़कादितुलादिर्मेयम् । चक्रपाणि भाष्य च. सू. 26/34

The quality which aids in measurement is called *Parimana.*

अणु दीर्घ महद् ह्रस्वमिति तद्भेद इरितः । कारिकावली

Anu, Dirgha, Mahat, Hraswa is types of *Parimana.* Classification of *Parimana:*

(i) *Dairghyamana* (Dimension) : Measuring the proportions of an object. It is further of two types as *Nitya* & *Anitya.*

Nitya Dravya is measured through *Paramanu* and *Anitya Dravya* is further subdivided into

(i) *Samkhya Janya*
(ii) *Parimana Janya*
(iii) *Pracaya Janya*

(ii) *Gurutwamana* (weight) : Which measures heaviness of an object. It is also of two types as *Nitya* and *Anitya.*

Amarakosha details 3 types of *Mana* as :

(i) *Pautava* (Measuring weight)

(ii) *Druvaya* (Measures volume)

(iii) *Payya* (Measures length)

E.g. 1. Weight of different ingredients in *Trikatu Churna* is the example for *Pautavamana.*

2. Measuring the final outcome after the preparation of *Triphala Kwatha* is an example for *Druvayamana.*

3. Measuring length of *Arjuna* tree is an example for *Payyamana.*

9. Samskara

The word *Samskara* is derived from

(पु) सम् + कृ-सुर् च । एतोगुणान्तराधानरूपे । वाचस्पति

संस्कारः करणं मतम् । च. सू. 26/34

करणं गुणान्तराधायकत्वं संस्करणमित्यर्थः । चक्रपाणि भाष्य च. सू. 26/34

The factor which imparts, modifies the qualities of a substance is called *samskara.*

करणं पुनः स्वाभाविकानां द्रव्याणामभिसंस्कारः ।

संस्कारो हि गुणान्तराधानमुच्यते । ते गुणस्तोयाग्निसन्निकर्ष शौचमन्थनदेशकाल वासनभावनादिभिः कालप्रकर्ष भाजनादिभिश्चाधीयन्ते । च. वि. 1/22

Qualities of a substance is influenced due to various factors like *Jala, Agni, Shauca, Manthana, Desha, Kala, Vasana, Bhavana, Kalaprakarsha, Bhajana* and others.

Cakrapani explains with examples :

1. *Shouca* - *Shali* when washed, cleaned and cooked becomes *Odana* which is light (*Laghu*).
2. *Manthana-Dadhi* which is *Shothakara* is transformed on churning with *Sneha* and becomes *Shothahara*.
3. *Desha-Mamsa* obtained from different region possess varied qualities. *Jangala Mamsa* is preferred to *Anupa*.
4. *Kala*-Rice which is naturally *Guru* becomes *Laghu* on storing for a year.
5. *Vasana*-Mixing *Dravyas* with *Sugandha Dravyas* imparts fragrance.
6. *Bhavana-Visha Dravyas* are poisonous, but its poisonous effects can be mitigated by subjecting it to *Bhavana* with *Gomūtra* or other procedures.
7. *Kalaprakarsha*-The *Shali* or *Madhu* which is kept as it is for years becomes *Purana* and aquire good qualities.
8. *Bhajana*-Applying *Triphala Kalka* to an iron vessel imparts *Rasayana* effect to *Triphala*.

Thus, *Samskaras* can be aptly utilised for treatment to enhance the qualities of medicines and thereby for a successful treatment.

10. Abhyasa

The word *Abhyasa* is derived from

(पु)-आभिमुख्येनास्यते क्षिप्यते असुक्षेपे अभ्यसनम् । आवर्तिः अभ्यासेन सततानुशीलनेन योगः । वाचस्पति

भावाभ्यसनमभ्यासः शीलनं सततक्रियाः । च. सू. 26/34

भावस्य षष्टिकादेव्ययिमादेश्चाभ्यसनमभ्यासः ।

अभ्यसनमेव लोकप्रसिद्धाभ्यां पर्यायाभ्यां विवृणोति-शीलनं सतत क्रियेति, यं लोकाः शीलनसततक्रियाभ्यामभिदधाति सोऽभ्यास इति भावः । चक्रपाणि भाष्य च. सू. 26/34

Regular usage of a substance/practice is called *Abhyasa*.

This is very relevant to treatment because for successful relief from a disease, continuous usage of medicaments and practices are very essential.

शेषत्वादायुषो याप्यः पथ्याभ्यासाद्विपर्यये । अ. हृ. सू. 1/32

Treatment of *Yapya* disorders is through regular usage of *Pathyahara* and *Vihara*.

6. Research Models

Assessment of *Guna*

I. Detection of *Guru/Laghu Guna*: Density method

a. Aim : To determine the *Guru /Laghu Guna* of the given drug by using Density method.

b. Materials Required:

- Drug sample
- 10 ml beaker.

c. Principle : According to the classics, *Gurutwa* of a substance is the *Asamavayi karana* (non inherent) of its initial fall (*Adya patana*). This principle is used to demonstrate the *Guru /Laghu Guna* of the drug. A quantitative determination of these *Gunas* can be done based on density method. By keeping the volume constant, the weight of the drug will be proportional to the density. In a previous study conducted on *Guru* and *Laghu Dravya* should take the mean value as standard value. Keeping that measurement as reference, weight of the drug should be measured if it is more than the mean value it is considered *Guru* and the weight of drug below this mean value is considered as *Laghu*.

d. Procedure:

- The fine powder of the drug was filled in a pre-weighed 10 ml beaker completely so that further no more filling was possible.
- Manual shaking was done frequently to eliminate any space in between the particles.
- The excess powder was wiped off with the flat portion of spatula and the beaker was then weighed.
- Weight of the powder was calculated by subtracting the weight of the jar from the combined weight.
- The procedure was repeated three times and the average weight was calculated and compared with reference value.

Inference: Weight of the drug above this mean value is considered *Guru* and the weight of drug below this mean value is considered as *Laghu*.

II. Detection of *Snigdha/ Ruksha Guna*

a. Principle: According to classics S*nigdhatwa* of a substance is the cause that binds the powder etc. to form a bolus (*Pindibhava hetu*). Based on this principle a standardized procedure is to be developed where water was added to the fine powder of the drug and the binding capacity of the powder particles and the nature of the bolus prepared using the soaked drug is assessed.

i. Detection of *Snigdha / Ruksha Guna:* Water absorption method

a. Aim: To determine the *Snigdha / Ruksha Guna* of given sample by assessing its water absorption capacity.

b. Materials required:

- Drug sample
- Distilled water
- Graduated 25ml measuring cylinder.

c. Procedure:

- The finely powdered C*hoorna* (powder)of the drug is taken up to 2.5ml mark in the graduated 25ml measuring cylinder i.e. the diameter of the graduated measuring cylinder is 2.5cm, so drug taken equivalent to the diameter of the vessel.
- A constant volume of water 2.5ml is added to it and allowed to soak.
- It is kept undisturbed for 15 minutes and observed for the nature of soaking.
- After 15 minutes the nature of soaking is examined.
- If the drug does not soak in water even after 15 minutes, uniform pricking is done along the sides of the measuring cylinder and then the time taken for complete soaking of drug is noted.
- Simultaneously the level of powder after soaking in the glass cylinder and the level of water which remain above the soaked powder, if any is also noted.
- If the drug is not found soaking after uniform pricking, more water added along the sides of measuring jar till complete soaking occurs and the amount of water added in excess is noted.

Inference: If the sample absorbs more water may be termed as *Ruksha* and absorbs less then may be inferred as *Snigdha*.

III. Detection of *Snigdha / Ruksha Guna*: Water binding method

a. Aim: To determine the *Snigdha / Ruksha Guna* of C*hoorna* of given drug sample by assessing its water binding capacity.

b. Materials required:

- Drug sample (powder)
- Distilled water
- Graduated 25ml measuring jar,
- Watch glass
- Clock

c. Procedure:

- The fine *Choorna* (powder) was taken up to 2.5ml mark in the graduated 25ml measuring jar.
- 2.5ml water is added to it and allowed to soak.
- It was kept undisturbed for 15 minutes and observed for the nature of soaking.
- After 15 minutes the nature of soaking is examined.
- If the drug does not soak in water uniform pricking is done along the sides of the measuring jar.
- If the drug is not found soaking even after uniform pricking, more water added along the sides of measuring jar till complete soaking occurs.
- Then drug is taken out and placed on a watch glass to observe the nature of mixing with water.
- It is made in the form of a bolus and kept undisturbed for another 15 minutes.
- The nature of bolus noted after 15 minutes.

Inference: If the powders bound with better compactness then it may be inferred that it is more *Snigdha* and if it is not compact then may be termed as *Ruksha*.

IV. Specific Gravity Determination

Purpose: This experiment is performed to determine the specific gravity of a drug by using a Pycnometer.

Specific gravity is the ratio of the mass of unit volume of drug at a stated temperature to the mass of the same volume of gas-free distilled water at a stated temperature.

Significance: The specific gravity of a drug is used in the phase relationship of air, water, and solids in a given volume of the drug.

Equipment required:

- Pycnometer
- Balance
- Vacuum pump
- Funnel
- Spoon

Test Procedure:

1. Determine and record the weight of the empty clean and dry pycnometer, W_P.
2. Place 10g of a dry drug sample (passed through the sieve No. 10) in the pycnometer. Determine and record the weight of the pycnometer containing the dry drug, W_{PS}.

3. Add distilled water to fill about half to three-fourth of the pycnometer. Soak the sample for 10 minutes.
4. Apply a partial vacuum to the contents for 10 minutes, to remove the entrapped air.
5. Stop the vacuum and carefully remove the vacuum line from pycnometer.
6. Fill the pycnometer with distilled (water to the mark), clean the exterior surface of the pycnometer with a clean, dry cloth. Determine the weight of the pycnometer and contents, W_B.
7. Empty the pycnometer and clean it. Then fill it with distilled water only (to the mark). Clean the exterior surface of the pycnometer with a clean, dry cloth. Determine the weight of the pycnometer and distilled water, W_A.
8. Empty the pycnometer and clean it.

Data Analysis: Calculate the specific gravity of the drug using the following formula:

Specific Gravity $G_s = W_o / W_0 + (W_A - W_B)$

W_0 = weight of sample of oven-dry drug, g = $W_{PS} - W_P$

W_A = weight of pycnometer filled with water

W_B = weight of pycnometer filled with water and drug

Exercises: Multiple Choice Questions (MCQ)

1. Total number of Gunas mentioned in Ayurveda
   a. 36 b. 40 c. 41 d. 20
   Ans: c. 41
2. Number of Gurvadi Gunas are
   a. 15 b. 20 c. 10 d. 5
   Ans: b. 20
3. Paradi Gunas are —— in number
   a. 10 b. 20 c. 5 d. 41
   Ans: a. 10
4. The Gunas known as Sharirika Gunas
   a. Adhyatmika Guna b. Vaisheshika Guna
   c. Paradi Guna d. Gurvadi Guna
   Ans: d. Gurvadi Guna
5. Gunas also known as Chikitsopayogi Gunas
   a. Gurvadi Guna b. Paradi Guna
   c. Vaisheshika Guna d. Adhyatmika Guna
   Ans: b. Paradi Guna

6. Guna having Brahmana Karma

a. Laghu b. Guru c. Ruksha d. Sukshma

Ans: b. Guru

7. Langhana Karma is done by —— Guna

a. Guru b. Snigdha c. Shita d. Laghu

Ans: d. Laghu

8. The Guna responsible for Stambhana Karma

a. Drava b.Guru c. Shita d. Ushna

Ans: c. Shita

9. Swedana Karma is due to

a. Guru b. Ushna c. Shita d. Sandra

Ans: b. Ushna

10. Kledana Karma is due to

a. Laghu b. Ruksha c. Vishada d. Snigdha

Ans: d. Snigdha

11. Shoshana Karma is due to

a. Snigdha b. Ruksha c. Laghu d. Drava

Ans: b. Ruksha

12. Manda Guna is responsible for

a. Shamana b. Shodhana c. Swedana d. Ropana

Ans: a. Shamana

13. Shodhana Karma is attributed to

a. Manda b. Guru c. Tikshna d. Shita

Ans: c. Tikshna

14. Shlathana Karma is attributed to

a. Mradu b. Tikshna c. Shita d. Ushna

Ans: a. Mradu

15. Kshalana Karma is due to

a. Picchila b. Vishada c. Drava d. Sandra

Ans: b. Vishada

16. Lepana Karma is because of

a. Drava b. Sandra c. Vishada d. Picchila

Ans: d. Picchila

17. Guna responsible for Lekhana Karma
    a. Khara b. Sukshma c. Vishada d. Picchila
    Ans: a. Khara
18. Visarga Kala may be considered as
    a. Apara b. Para c. Yukti d. Parimana
    Ans: b. Para
19. Anupa Desha may be considered as
    a. Apara b. Prathakatwa c. Para d. Vibhaga
    Ans: a. Apara
20. Guna denoting number or calculation
    a. Samyoga b. Vibhaga c. Prathakatwa d. Sankhya
    Ans: d. Sankhya
21. Bhagashograha comes under which Guna
    a. Para b. Abhyasa c. Vibhaga d. Samyoga
    Ans: c. Vibhaga
22. Vailkshnya is includedunder
    a. Prathakatwa b. Samyoga c. Vibhaga d. Abhyasa
    Ans: a. Prathakatwa
23. Asamyoga is included under
    a. Samyoga b. Prathakatwa c. Abhyasa d. Yukti
    Ans: b. Prathakatwa
24. Quality which aids in the measurement
    a. Abhyasa b. Samskara c. Parimana d. Yukti
    Ans: c. Parimana
25. Gunas beneficial in Vatavyadhi
    a. Snigdha & Ushna b. Ruksha & Shita
    c. Laghu & Shita d. Ruksha & Laghu
    Ans: a. Snigdha & Ushna
26. Gunas beneficial in Pitta Vyadhi
    a. Snigdha & Ushna b. Ruksha & Shita
    c. Laghu & Ushna d. Ushna & Drava
    Ans: b. Ruksha & Shita
27. Gunas responsible for Kaphaja Vyadhi
    a. Shita & Picchilab. Snigdha & Drava
    c. Ruksha & Ushna d. Snigdha & Shita
    Ans: Ruksha & Ushna

4 Chapter

Rasa Vijnana

Contents

- *Rasa Paribhasha - Rasa Shabdasya Nanartha* (Rasa meaning in different context)
- *Rasa Lakshana* (Characteristics)
- *Rasa Sankhya* (Number of Taste)
- *Shadrasa* in relative correlation with taste of chemical constituents
- *Rasanam Panchabhautikatwam* (Predominance of Mahabhuta), *Rasa Nivratti Vishesha Hetu* (Formation of six tastes) & *Shannanam Rasasya Panchabhautika Sanghatanam Vaishishtyam*
- *Shat Rasanam Lakshanani* (Characteristics of six tastes)
- *Shatrasanam Gunakarmani* (Properties and actions of six tastes)
- *Rasatisevanajanya Vikara* (Diseases Due to Excessive Intake of Different *Rasa* Tastes)
- *Rasa Gunanam Uttama, Madhyama, Adhamatwena Vyavastha* (Grading of *Rasa* (Tastes) with Special Reference to Their Qualities)
- *Taratamata of Rasa* (Relative Superiority of Taste Based on Quality)
- *Raseshu Doshadushyanam Shamanatwa* (Effect of *Rasa* on *Dosha*-Alleviation & Aggravation)
- *Rasa Prayoga* as *Aushadha*
- *Rasa Prayoga* as *Ahara*
- Clinical application and Research updates of *Shadrasa*
- *Rasa* and *Anurasasya Bheda*

1. *Rasa Paribhasha-Rasa Shabdasya Nanartha* (*Rasa* meaning in different context)

On literary review, we come across various meanings for the term '*Rasa*' under different contexts. Of these, four meanings are note-worthy here.

1. Rasa-as Dhatu

तत्र रस गतौ धातुः, रसति अहरहर्गच्छतीति रसः । सु. सू. 14/13

Rasa is one which circulates all over the body, it is one among the *Saptadhatu.*

2. Rasa-as Parada (Mercury)

रसनात् सर्वधातूनां रसेन्द्र इति कीर्तितः । र. र. स.

रसति भक्षयति सर्वान् लोहान् इति रसः । द्र. गु. वि.

Mercury which engulfs other *Loha* (Metals) like *Swarna* (Gold), *Rajata* (Silver) etc. is known as *Rasendra*.

3. Rasa-as Kalpana (Preparation)

आहतात्तत्क्षणाकृष्टा द्रव्यात्क्षुण्णात्समुद्धरेत् । वस्त्रनिष्पीडितो यः स रसः स्वरस उच्यते ॥
शा. स. म. 1/2

रसति शरीरे आशुप्रसरति इति रसः । द्र. गु. वि.

The juice procured by pounding drugs or by other procedures and which is absorbed quickly is called *Rasa*.

4. Rasa-as an Indriyartha

रस्यते आस्वाद्यते इति रसः । च. द.

रसनेन्द्रिय ग्राह्यत्वात् रसः । अ. हृ. सू. 1/14-15 स. सू.

तत्र रसना ग्राह्यो रसः । अ. हृ. सू. 1/14-15 आ. र.

रसनेन्द्रिय ग्राह्यो योऽर्थः स रसः । शिवदास सेन

The *Rasa* (Taste) is a special entity, which is perceived by *Rasanendriya* (Tongue).

Among these four meanings fourth one *Rasa* as an *Indriyartha* is considered in *Dravyaguṇa*.

2. *Rasa Lakshana* (Characteristics)

रसनार्थो रसः ।

रसनार्थो रसस्तस्य द्रव्यमापः क्षितिस्तथा । कारिकावली

Rasa is an *Indriyartha* of *Rasanendriya* and the taste which is perceived by an individual is itself its characteristic feature.

3. *Rasa Sankhya* (Number of Rasa)

षडेव रसाः इत्युवाच भगवानात्रेयः पुनर्वसुः, मधुराम्ललवण कटुतिक्त कषायाः । च. सू. 26/9

Rasas are six in number.

1. *Madhura* - *Kshira, Draksha*
2. *Amla* - *Changeri, Jambira*
3. *Lavana* - *Saindhava, Samudra Lavana*

4. *Katu* - *Pippali, Maricha*
5. *Tikta* - *Kiratatikta, Chandana*
6. *Kashaya* - *Khadira, Haritaki*

Modern Equivalent Terms for Six Tastes

1. *Madhura* - Sweet
2. *Amla* - Sour
3. *Lavana* - Salty
4. *Katu* - Pungent
5. *Tikta* - Bitter
6. *Kashaya* - Astringent

Modern Concepts on Taste

The actual organ of taste is called the taste bud. Each taste bud (there are approximately 10,000 taste buds in humans) is made up of many (between 50-150) receptor cells. Receptor cells live for only 1 to 2 weeks and then are replaced by new receptor cells. Each receptor in a taste bud responds best to one of the basic tastes. A receptor can respond to other tastes, but it responds strongest to a particular taste. There are two cranial nerves that innervate the tongue and are used for taste i.e.

i) Facial Nerve (7^{th} Cranial Nerve)

ii) The Glossopharyngeal Nerve (9th cranial nerve)The facial nerve innervates the anterior (front) 2/3rd of the tongue and the glossopharyngeal nerve innervates that posterior (back) 1/3rd part of the tongue. Another cranial nerve (10th) i.e. *Vagus* nerve carries taste information from the back part of the mouth. The cranial nerves carry taste information into the brain to a part of the brain stem called the "nucleus of the solitary tract." From the nucleus of the solitary tract, taste information goes to the thalamus and then to the cerebral cortex.Like information for smell, taste information also goes to the limbic system (Hypothalamus and amygdala). Another cranial nerve (5th), the trigeminal nerve also innervates the tongue, but is not used for tatse.

Note:

- The complete inability to taste is called Ageusia.
- Reduced inability to taste is called Hypogeusia.
- Enhanced ability to taste is called Hypergeusia.

Types of the Taste

There are five basic tastes.

1. Sweet
2. Sour

3. Salty
4. Bitter
5. Umami-Recently discovered taste

1. **Sweetness** : Sweetness is produced by the presence of sugars, proteins and few other substances. Sweetness is detected by a variety of 'G protein coupled receptors' coupled to the 'G protein gustducin' found on the taste buds.
2. **Sourness** : Sourness is the taste that detects acidity. The mechanism for detecting sour taste is similar to that which detects salt taste.
3. **Saltiness** : Saltiness is a taste produced primarily by the presence of sodium ions. Other ions of the alkali metals group also taste salty.
4. **Bitterness** : The bitter taste is perceived by many to be unpleasant and disagreeable. Common bitter foods and beverages include coffee and quinine. Research has shown that TAS 2RS (taste receptors, type 2, such as TAS 2R38) coupled to the G protein gustducin are responsible for the human ability to taste bitter substances.
5. **Umami** : Umami is the name for taste sensation produced by compounds such as glutamate and are commonly found in fermented foods. In English it is also known as meatiness or savouriness.

4. *Shadrasa* in relative correlation with taste of chemical constituents

- *Madhura* - Carbohydrates
- *Amla* - Acids
- *Lavana* - Salts
- *Katu* - Volatile oils
- *Tikta* - Alkaloids, Bitter glycosides
- *Kashaya* - Tannins

5. *Rasanam Panchabhautikatwam, Rasa Nivratti Vishesha Hetu & Shannanam Rasasya Panchabhautika Sanghatanam Vaishishtyam*

सौम्याः खल्वायोऽन्तरिक्षप्रभवाः प्रकृतिशीता लाध्व्यश्चाव्यक्तरसाश्च, तास्त्वन्त-रिक्षाद्भ्राश्यमाना भ्रष्टाश्च पञ्चमहाभूतगुणसमन्विता जङ्गम स्थावराणां भूतानां मूर्तीरभिप्रीणयन्ति, तासु षडभिमूर्च्छन्ति रसाः । च. सू. 26/39

सौम्या इत्यादि । सौम्या सोमदेवताकाः । भृश्यमाना इति वदता भूमिसम्बन्ध-व्यतिरेकणान्तरीक्षेरितैः पृथिव्यादि परमाण्वादिभिः संबन्धो रसारम्भको भवतीति दर्श्यते । मूर्तिरिति व्यक्तिः । अभिप्रीणयन्तीति तर्पयन्ति, किं वा जनयन्ति । अभिमूर्च्छन्ति रसा इति व्यक्तिं यान्ति । अत्र चान्तरीक्षमुदकं रसकारणत्वे प्रधानत्वादुक्तं, तेन क्षितिस्थमणि स्थावरजङ्गमोत्पत्तौ रसकारणं भवत्येव । चक्रपाणि भाष्य-च. सू. 26/39

आकाशपवनदहन तोथ्यभूमिषु यथासङ्ख्यमेकोत्तरपरिवृद्धाः शब्दस्पर्शरूप रसगन्धाः, तस्मादाप्यो रसः । परस्पर संसर्गात् परस्परानुग्रहात् परस्परानुप्रवेशाच्च सर्वेषु सर्वेषां सन्निध्यमस्ति, उत्कर्षापकर्षात्तु ग्रहणम् । स खल्वाप्यो रसः शेषभूत संसर्गाद्विदग्धः षोढ़ा विभव्यतेः तद्यथा मधुरोऽम्लो लवणः कटुकारतिक्त कषाय इति । सु. सू. 42/3

क्ष्माम्भोग्निक्ष्माम्बुतेजःखवाय्वग्नि अनिलगोनिलैः । द्वयोल्बणैः क्रमाद्भूतैर्मधुरादिरसोद्भवः ।

अ. हृ. सू. 10/1

द्रव्यस्य पाञ्चभौतिकत्वात् तदाश्रित रसेऽपि पाञ्चभौतिकः । योगेन्द्रनाथ सेन

Jala is the substrata for all *Rasa,* when *Jala* which is *Soumya* in *Antariksha* (Atmosphere) will have *Avyakta Rasa* (No taste), when it touches ground it acquires all *Panchabhautika* qualities attains 6 individual tastes which nourish the animals and plants.

Sushruta opines that because of combinations of different *Mahabhutas* the manifestation of 6 *Rasas* occur. All the six *Rasas* will have all the *Mahabhutamshas,* but one or two *Mahabhutas* will be dominant.

Yogendranath Sen gives a logical point that when *Dravya* is *Panchabhautika,* automatically the *Rasa* which is residing in *Dravya* must be *Panchabhautika.*

रसनार्थो रसस्तस्य द्रव्यमापः क्षितिस्तथा । निवृत्तौ च विशेषे च प्रत्ययाः खादयस्त्रयः ॥

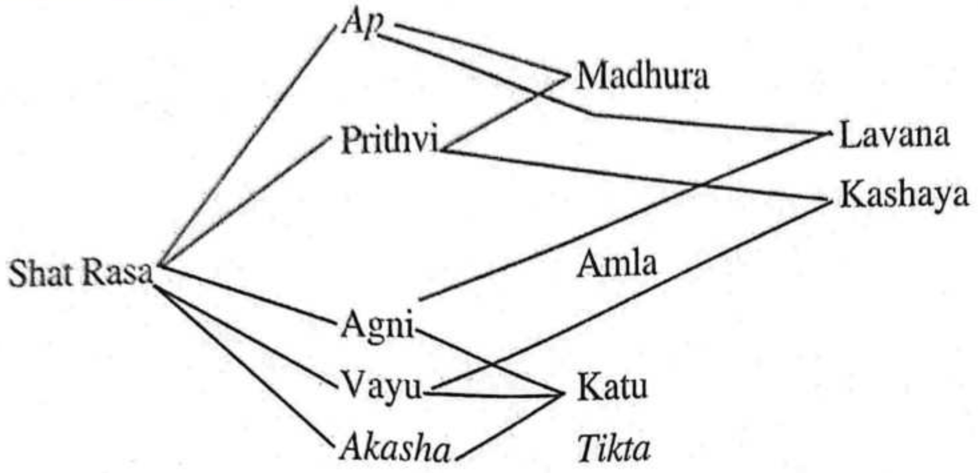
च. सू. 1/64

रसनार्थ इत्यादि । रस्यत आस्वाद्यत इति रसः । रसनार्थ इति जिह्वाग्राह्यः । एतच्च षण्णामपि रसानामनुगतं रूपादिषु च व्यावृत्तत्वात् साधुलक्षणम् । तस्येति रसस्य । द्रव्यमिति आधारकारणम् । ....क्षितिजलसंबन्धः;.........रसस्य किं व्यक्तावक्षिती कारणं किं वा विशेष इत्याहनिवृत्तावित्यादि । निवृत्तौ चेति अभिव्यवतौ । एतेन रसोऽभिव्यज्यमानो जलक्षित्याधार एव व्यज्यत इति दर्शयति । चकाराद्विशेषेऽपि मधुरादि लक्षणे अक्षिती प्रत्ययौ । तेन 'सोमगुणातिरेकान्मधुरः, पृथिव्यग्निगुण्यतिरेकादम्लः' इत्यादिना जलपृथिव्योरपि विशेषकारणत्वं वक्ष्यमाणमुपपन्नम् । विशेष च प्रत्ययाः खादय इति मधुरादिविशेषनिवृत्तौ निमित्तकारणं खवाय्वनलाः, न त्वाधारकारणभूताः । खादय इत्यनेनैव त्रित्वे लब्धे पुनस्त्रयः इति वचनं तेषामेव व्यस्तसमस्तानामपि प्रत्ययत्वदर्शनार्थम्; अत एव व्यस्तसमस्ताकाशादि संसर्गभेदाद्रसानां मधुर तरमधुरतमाद्यवान्तरभेद उपपन्नः । चक्रपाणि-च. सू. 1/64

The *Rasa* which is an *Indriyartha* of *Rasanendriya,* takes its origin from *Ap* & *Prithvi Mahabhuta* and hence *Ap* & *Prithvi Mahabhutas* are the *Adhara Karana.* Remaining three *Mahabhutas* like *Akasha, Vayu* & *Agni* are also contributing to the manifestation of different *Rasas,* hence they are considered as *Nimitta Karana.* Here *Vishesha* also implies a meaning that the time factor also plays an important role in formation of *Rasas.* All the *Rasas* are having *Panchamahabhutamshas* but there will be dominance of two *Mahabhta* which decide the particular *Rasa.*

Another concept is, it is because of the permutation and combination of these *Mahabhutas* variations in taste like *Madhura Tara, Madhura Tama* etc are noticed.

***Schematic Representation of Origin of* Rasa**



All the *Rasas* (tastes) have five *Mahabhūtas,* but mani-festation of various *Rasas* depends on the predominant *Mahabhutas* and their combination in particular way.

तेषां षण्णां रसानां सोमगुणातिरेकान्मधुरो रसः पृथिव्यग्नि भूयिष्ठत्वादम्लः, सलिलाग्निभुयिष्ठत्वाल्लवणः, वाय्वग्नि भूयिष्ठत्वात् कटुकः वाय्वाकाशातिरित्त्वा तिक्तः, पवन पृथिव्यतिरेकात् कषाय इति । च. सू. 26/40

तत्र, भूम्यम्बुगुण बाहुल्यान्मधुरः, भूम्यग्निगुणबाहुल्यादम्लः, तोयाग्निगुणबाहुल्याल्लवणः, वाय्वग्निगुणबाहुल्यात् कटुकः वाय्वाकाश गुण बाहुल्यात्तिक्तः, पृथिव्यनिलगुणबाहुल्यात् कषाय इति । सु. सू. 42/3

क्ष्माम्भोग्निक्ष्माम्बुतेजः खवाय्वग्नि अनिलगोनिलैः । द्वयोल्बणैः क्रमाद्भूतैर्मधुरादिरसोद्भवः ॥

अ. हृ. सू. 10/1 (आ. रसायन (हेमाद्रि))

तत्र रसानामुत्पत्तिमाह-क्ष्माम्भोग्निनिति । पृथिव्युदकाभ्यामुल्वणाभ्यां मधुर-रसस्योत्पत्तिः, तेजः पृथिवीभ्यामम्लस्य, उदकतेजोभ्यां लवणस्य, वाय्वाकाशाभ्यां तिक्तस्य, तेजोवायुभ्यां कटुकस्य, वायुपृथिवीभ्यां कषायस्य । तत्र पृथिव्यपां बाहुल्यान्मधुरं विद्यात् अम्लमपामग्नेश्च, लवणमग्नेरपां च, कटुकमग्नेर्वायोश्च, तिक्त कस्य वायोश्च, कषायमग्नेर्वायोश्च । र. वै. अ. 3/38-43

Chart showing predominant *Mahabhutas* in *Rasa* as per *Brahatrayis.*

Sl. No.	*Rasa*	*Caraka Samhita*	*Sushruta Samhita*	*Ashtanga Hrdaya*
1.	*Madhura*	*Ap & Prathvi*	*Prathvi & Ap*	*Prathvi & Ap*
2.	*Amla*	*Prathvi & Agni*	*Prathvi & Agni*	*Agni & Prathvi*
3.	*Lavana*	*Ap & Agni*	*Ap & Agni*	*Ap & Agni*
4.	*Katu*	*Vayu & Agni*	*Vayu & Agni*	*Agni & Vayu*

5.	*Tikta*	*Vayu & Akasha*	*Vayu &Akasha*	*Vayu & Akasha*
6.	*Kashaya*	*Vayu & Prathvi*	*Prathvi & Vayu*	*Vayu & Prathvi*

Note: *Caraka* and *Sushrutacharya* have no difference of opinion regarding *Mahabhuta* composition of Shat Rasas, but *Acharya Nagarjuna* differs when it comes to *Kashaya Rasa,* he opined that *Kashaya* is having dominance of *Agni & Vayu Mahabhutas.* And *Lavana* is *Agni Mahabhuta* predominant.

6. *Shat Rasanam Lakshanani* (Characteristics of six tastes)

Each *Rasa* will possess its own characteristic features.

1. Madhura Rasa Lakshana (Characteristics of Sweet Taste)

स्नेहनप्रीणनाह्लादमार्दवैरुपलभ्यते । मुखस्थो मधुराश्चास्यं व्याप्नुवलिम्पतीव च ॥
च. सू. 26/74

तत्र यः परितोषमुत्पादयति प्रह्लादयति तर्पयति जीवयति मुखोपलेपं जनयति श्लेष्माणं चाभिवर्धयति स मधुरः । सु. सू. 42/9

तेषां विद्याद्रसं स्वादुं यो वक्त्रमनुलिम्पति । आस्वाद्यमानो देहस्य ह्लादनोऽक्षप्रसादनः ॥
प्रियः पिपीलिकादीनाम्.................. । अ. हृ. सू. 10/2

Sweetness is identified with its *Snehana* (unctuousness), *Prinana* (Deliciousness), *Ahladana* (Pleasantness) and *Mardavatva* (Softness), when consumed it spreads all over the mouth and sticks firmly. *Tarpayati* (Nourishes the body), *Jivayati* (Sustains the life), *Shleshmanam Abhivardhayati* (Increases the *Kapha Dosha*). *Akshaprasadana* (Nourishes the sense organs) & *Priyaha Pipilikadinam* (Liked by ants).

2. Amla Rasa Lakshana (Characteristics of Sour Taste)

दन्तहर्षान्मुखास्त्रावात् स्वेदनान्मुखबोधनात् । विदाहच्चास्यकण्ठस्य प्राह्यैवाम्लं रसं वदेत् ॥
च. सू. 26/75

यो दन्तहर्षमुत्पादयति मुखास्त्रावं जनयति श्रद्धां च उत्पादयति सोऽम्लः । सु. सू. 42/9

अम्ल क्षलयते मुखम् । हर्षणो रोमदन्तानामक्षिभ्रुवनिकोचनः ॥ अ. हृ. सू. 10/3

Sourness is identified with its actions like *Dantaharsha* (Prickling sensation of tooth), *Mukhasrava* (Salivation), *Swedana* (Sweating), *Mukhabodhanat* (Clarity in mouth), *Vidahaschasyakanthasya* (Burning sensation in mouth & throat), *Shraddham ca Utpadayati* (Creates interest towards the taste) & *Akshibhru-vanikocana* (Closing of eyes).

3. Lavana Rasa Lakshana (Characteristics of Saline Taste)

प्रलीयन् क्लेदविष्यन्दमार्दवं कुरुते मुखे । यः शीघ्रं लवणो ज्ञेयः स विदाहान्मुखस्य च ॥
च. सू. 26/76

यो भक्तरुचिमुत्पादयति कफप्रसेकं जनयति मार्दव चापादयति स लवणः । सु. सू. 42/9

लवणः स्यन्दयत्यास्यं कपोलगलदाहकृत् । अ. हृ. सू. 10/4

Saline taste is one which is *Praliyan* (Dissolves quickly), *Kleda* (Moistens), *Vishyandakaraka Mardavam* (Softens for a while), *Vidahan Mukhasya* (Causes burning sensation in mouth), *Bhaktaruchim utpadayati* (Gives good taste to the food), *Kapha prasekam Janayati* (Which cause salivation), *Mardavamapadayati* (Takes away soften nature) & *Kapolagala Dahakrat* (Causes burning sensation over cheek and throat).

Note: *Mardavam Kuruta* reference should be under-stood as it softens for a while then causes dryness.

4. Katu Rasa Lakshana *(Characteristics of Pungent Taste)*

संवेजयेद्यो रसनं निपाते तुदतीव च । विदहन्मुखनासाक्षि संस्रावी स कटु स्मृतः ॥

च. सू. 26/77

यो जिह्वाग्रं बाधते उद्वेगं जनयति शिरो गृह्णीते नासिकां च स्त्रावयति स कटुकः । सु. सू. 42/9

उद्वेजयति जिह्वाग्रं कुर्वंश्चिमिचिमां कटुः । स्त्रावयत्यक्षिनासास्यं कपोलौ दहतीव च ॥

अ. हृ. सू. 10/5

Katu Rasa (Pungent taste) causes irritation to tongue (*Rasana*), *Nipate tudativa Ca* (Causes pricking pain), *Vidahanmukhanasakshi Samsravi* (Causes burning sensation over mouth, nose & eyes and cause secretions) & *Kapolau Dahativa Ca* (Causes burning sensation over cheek).

5. *Tikta Rasa Lakshana* (Characteristics of Bitter Taste)

प्रतिहन्ति निपाते यो रसनं स्वदते न च । स तिक्तो मुख वैशद्यशोषप्रह्लादकारकः ॥

च. सू. 26/78

यो गले चोषमुत्पादयति मुखवैशद्यं जनयति भक्तरुचिं चापादयति हर्षं च स तिक्तः ।

सु. सू. 42/9

तिक्तो विशदयत्यास्यं रसनं प्रतिहन्ति च । अ. हृ. सू. 10/4

Tikta Rasa (Bitter taste) when consumed *Pratihanti Nipate Yo Rasanam* (Which will not allow to perceive other tastes), *Swadate na cha* (Which itself is not tasty) *Mukha Vaishadya Karaka* (Cleanses the mouth), *Shoshakarata* (Cause dryness), *Prahladakaraka* (Gives pleasent feeling), *Gale Coshamutpadayati* (Which cause burning sensation in throat), *Bhaktaruchimpadayati* (Takes away the good taste of preparations) & *Harsham Cha Āpadayati* (People won't desire to take bitter substances).

6. *Kashaya Rasa Lakshana (Characteristics of Astringent Taste)*

वैशद्यस्तम्भजाड्यैर्यो रसनं योजयेद्रसः । बध्नातीत च यः कण्ठं कषायः स विकास्यपि ॥

च. सू. 26/79

यो वक्त्रं परिशोषयति जिह्वां स्तम्भयति कण्ठं बध्नाति हृदयं कर्षति पीडयति च स कषाय इति ।

सु. सू. 42/9

कषायो जाडये जिह्वां कण्ठस्त्रोतोविबन्धकृत् । अ. हृ. सू. 10/6

Kashaya Rasa (Astringent taste) when consumed causes *Vaishadya* (Non-sliminess), *Sthambha* (Stiffness), *Jadyata* (Slows down the functions of tongue), *Badhnativa Cha Ya Kantham* (Causes obstructions in throat), *Vikasyapi* (Has got *Vikasi* action which is not good for heart), *Hradayam Pidayati* (Cause discomfort heart) & *Srotovibandha Krat* (Obstructs the channels).

These actions are observed when the *Dravya* which is having only one *Rasa* is consumed.

7. *Shatrasanam Gunakarmani* (Properties and actions of six tastes):

1. *Madhura Rasa* (General Properties of Sweet Taste)

तत्र, मधुरो रसः शरीरसात्म्याद्रसरुधिरमांसमेदोस्थिमज्जौजः शुक्राभिवर्धन आयुष्यः षडिन्द्रियप्रसादनोबलवर्णकरः पित्तविषमारुतघ्नस्तृष्णादाह प्रशमनस्त्वच्यः केश्यः कण्ठयो बल्यः प्रीणनो जीवनस्तर्पणो बृंहणः स्थैर्यकरः क्षीणक्षतसन्धानकरोघ्राणमुखकण्ठौष्टजिह्वाप्रह्लादनो दाहमूर्च्छाप्रशमनः षट्पदपिपीलिकानामिष्टतमः स्निग्धशीतोगुरुश्च । च. सू. 26/43(1)

तत्र, मधुरो रसो रसरक्तमांसमेदोऽस्थिमज्जौजः शुक्रस्तन्यवर्धनश्चक्षुष्यः केश्यो वर्ण्यौ बलकृत्सन्धानः शोणितरसप्रसादनोबालवृद्धक्षतक्षीणहितः षट्पद-पिपीलिकानामिष्टत-मस्तृष्णामूर्च्छादाहप्रशमनः षडिन्द्रियप्रसादनः कृमिकफकरश्चेतिः । सु. सू. 42/9(1)

.........मधुरो रसः ।
आजन्मसात्म्यात् कुरुते धातूनां प्रबलं बलम् । बालवृद्ध क्षतक्षीण वर्णकेशेन्द्रियौजसाम् ॥
प्रशस्तो बृंहणः कण्ठयः स्तन्यसन्धानकृद्गुरुः । आयुष्यो जीवनः स्निग्धः पित्तानिल विषापहः ॥

अ. हृ. सू. 10/6-8

Dosha Karma	*Dhatu Karma*
Vatapittahara *Kaphavardhana*	*Rasadi Sapta Dhatu Vardhaka, Ojovardhaka, Ayushkara* (Increases life span), *Shadindriya Prasadaka* (Nourishing sense organs and also pleases the mind), *Balakara* (increases strength), *Varnakara* (Gives good complexion), *Vishahara* (Reduces

	potency of poison), *Trashnahara* (Quenches the thirst), *Dahaprashamaka* (Reduces burning sensation), *Twachya* (Good for skin), *Keshya* (Good for hairs), *Kanthya* (Conducive to throat), *Prinana* (Nourishes all body parts, *Jivana* (Sustains the life), *Brahmana* (Gives bulkiness), *Kshinakshata Sandhanakara* (Heals up), *Sthairyakara* (Gives stability), *Ghrana, Mukha, Kantha, Oshta, Jihwa Prahladana* (Soothing effect on nose, mouth, throat, lips and tongue), *Murcha Prashamana* (Relieves from unconsciousness) *Stanyavardhaka* (Improves breastmilk) and *Krimikara* (Causes for the manifestation of worms)
Other effects & features	Liked by ants and insects

2. Amla Rasa (General Properties of Sour Taste)

अम्लो रसं भवतं रोचयति, अग्निं दीपयति, देहं बृंहयति, ऊर्जयति, मनो बोधयति इन्द्रियाणि दृढ़ीकरोति, बलं वर्धयत्ति, वातानुलोमयति, हृदयं तर्पयति, अस्यामास्त्रावयति, भुक्तमपकर्षयति कोदयति जरयति, प्रीणयति, लघुरुष्ण स्निग्धश्च । च. सू. 26/43(2)

अम्लो जरणः पाचनो दीपनः पवननिग्रहणोऽनुलोमनः कोष्ठविदाही बहिःशीतः क्लेदनः प्रायशोह्द्यश्चेति । सु. सू. 42/9(2)

अम्लोऽग्निदीप्तिकृत् स्निग्धोहृद्यः पाचनरोचनः । उष्णवीर्योहिमस्पर्शः प्रीणनः क्लेदनो लघुः । करोति कफपित्तास्त्रंमूढ़वातानुलोमनः ॥ अ. हृ. सू. 10/10

Guna (Qualities)	*Doshakarma*
Laghu, Ushna, Snigdha, Himasparsha (Cold to touch)	*Vata Shamaka* (Alleviate *Dosha*) *Kaphapittakaraka* (Aggra vate *Pitta* & *Kapha*
Dhatukarma	*Bhaktamrochayati* (Increases deliciousness of preparations), *Agnidipana* (Appetizer), *Deha Brahmanakaraka* (Increases bulk of the body), *Urjakara* (Gives energy), *Manobodhaka* (Sharpens mind), *Indriya Dradhikaraka* (Energises sense organs), *Balavardhaka* (Gives strength), *Vatanulomaka* (Brings *Vata* to its normal pathway), *Hradaya Tarpaka* (Gives strength to heart), *Asya Sravaka* (Cause salivation), *Bhaktamapakarshaka* (helps in swallowing), *Kledaka* (Moistens), *Jarayati* (Digests the food), *Koshta Vidahi* (Causes burning sensation in throat).

3. Lavana Rasa *(General Properties of Salt Taste)*

लवणो रसः पाचनः क्लेदनो दीपनश्च्यावनश्छेदनो भेदनस्तीक्ष्णः सरो विकास्यधः स्रंस्यवकाशकरो वातहरः स्तम्भबन्धसङ्घातविधमनः सर्वरस प्रत्यनीकभूतः, आस्यामास्रावयति, कफं विष्यन्दयति, मार्गान् विशोधयति, सर्वशरीरावयवान् मृदुकरोति, रोचयत्याहारम्, आहारयोगी नात्यर्थे गुरु-स्निग्ध उष्णश्च । च. सू. 26/43(3)

लवणः संशोधन पाचनो विश्लेषण क्लेदनः शैथिल्यकृदुष्णः सर्वरसप्रत्यनीको मार्गविशोधनः सर्वशरीरावयवमार्दवकरश्चेतिः । सु. सू. 42/9(3)

लवणः स्तम्भसङ्घातबन्धविध्मापनोऽग्निकृत् । स्नेहनः स्वेदनस्तीक्ष्णो रोचनश्चेदभेदकृत् ॥

अ. हृ. सू. 10/12-13

Guna (Qualities)	*Doshakarma*
Nati Guru, Snigdha, Ushna, Tikshna, Sara	Vatahara, Kapha Vardhaka
Dhatukarma	*Pacana* (Digestant), *Kledana* (Moistening), *Dipana* (Appetizer), *Chedana* (Produces excision effect), *Bhedana* (Incision), *Vikasi* (Clear), *Adhasramsya* (Laxative), *Avakashakara* (Clear), *Sthambha, Bandha & Sanghata Vidhamana* (Cure stiffness, obstruction and accumulation), *Sarvarasa Pratyanikabhuta* (Nullifies the effect of other tastes), *Asyasravaka* (Salivation), *Marga Vishodhaka* (Clear the channels), *Sarva Shariravayavan Mradu Karoti* (Softens all the body parts), *Rocayatyaharan* (Gives good taste to the food).

4. Katu Rasa *(General Properties of Pungent Taste)*

कटुको रसो वक्त्रं शोधयति, अग्निं दीपयति, भुक्तं शोषयति, घ्राणमास्रावयति, चक्षुर्विरेचयति, स्फुटीकरोतीन्द्रियाणि, अलसकश्वयथूपचयोदर्दाभिष्यन्दस्नेहस्वेदक्लेद-मलानुपहन्ति, रोचयत्यशन, कण्डूर्विनाशयति, व्रणानवसादयति, क्रिमीन् हिनस्ति, मांसं विलिखति, शोणित सङ्घातं भिनत्ति, बन्धाश्छिनत्ति, मार्गान् विवृणोति श्लेष्माणं शमयति, लघुरुष्णो रूक्षश्च । च. सू. 26/43(4)

कटुको दीपनः पाचनो रोचनः शोधनः स्थौल्यालस्यकफकृमिविष कुष्ठकण्डू-प्रशमनः सन्धिबन्धविच्छेदनोऽवसादनः स्तन्यशुक्रमेदसामुपहन्ता चेति । सु. सू. 42/9(4)

कटुर्गलामयोदर्दकुष्ठालसकशोफजित् । व्रणावसादनः स्नेहमेदःक्लेदोपशोषणः ॥
दीपनः पाचनो रुच्यः शोधनोऽन्नस्य शोषणः । छिनत्ति बन्धान् स्रोतांसि विवृणोति कफापहः ॥

अ.हृ.सू. 10/17-18

Guna (Qualities)	*Doshakarma*
Laghu, Ushna, Ruksha	*Kaphahara, Vatapittavardhaka*
Dhatukarma	*Vaktrashodhaka* (Cleanses the mouth), *Agnidipaka* (Appetizer), *Bhuktam shoshayati* (helps in absorption), *Ghranamasravayati* (Secretion from the nose), *Cakshurvirecyati* (Causes lacrimation), *Sphutika-rotindriyani* (Brings proper action from sense organs), *Alasaka, Shwayathu, Upacaya, Udarda, Abhishyanda, Sneha, Sweda, Kleda Malapupahanti* (Cure diseases like inflammation, obesity, Urticaria, Conjunctivitis and helps in the elimination of waste products), *Rocayatyashanam* (Gives good taste), *Kandurvinashayati* (Alleviates itching) *Vrananavasadayati* (Stops excess growth of wound), *Krimin Hinasti* (Alleviates germs), *Mamsa Vilikhati* (Scrapes away unwanted growth in muscle tissue), *Shonita Sanghata Bhinatti* (Breaks the blood clots), *Bandhanschinatti* (Breaks the obstructions), *Margan Vivranoti* (Clear the channels), *Kushthaghna* (Good for skin disorders), *Stanya Sukramedasamupahata* (Reduces breastmilk, semen and fatty tissue).

5. Tikta Rasa (General Properties of Bitter Taste)

तिक्तो रसः स्वयमरोचिष्णुरष्यरोचकघ्नो विषघ्नः क्रिमिघ्नोमूर्च्छादाह कण्डू-कुष्ठतृष्णाप्रशमनस्त्वङ्मांसयोः स्थिरीकरणो ज्वरघ्नः दीपनः पाचनः स्तन्यशोधनो लेखनः क्लेदमेदोवसामज्जलसीकापूयस्वेदमूत्रपुरीषपित्तश्लेष्मोपशोषणो रूक्षः शीतो लघुश्च ।

च. सू. 26/42(5)

तिक्तश्छेदनो रोचनो दीपनः शोधनः कण्डूकोठतृष्णामूर्च्छाज्वरप्रशमनः स्तन्य-शोधनो विण्मूत्रक्लेदमेदोवसापूयोपशोषणश्चेति । सु. सू. 42/915

तिक्तः स्वयमरोचिष्णुररुचिं कृमितृड्विषम् । कुष्ठमूर्च्छाज्वरोत्क्लेशदाहपित्तकफान् जयेत् ॥
क्लेदमेदोवसामज्जाशकृन्मूत्रोपशोषणः । लघुर्मेध्यो हिमो रूक्षः स्तन्यकण्ठविशोधनः ॥

अ. हृ. सू. 10/14-16

Guna (Qualities)	*Doshakarma*
Ruksha, Shita, Laghu	*Pittakapha Shamaka, Vata vardhaka*
Dhatukarma	*Swayamrochishnurapyarochakaghno* (Itself is not tasty but cures anorexia), *Vishaghna* (Anti piosonous), *Krmighna* (Anthelmintic), *Murcha, Daha, Kandu, Kushtha, Trashna*

	Prashamana (Relieves from fainting, burning sensation, itching, skin diseases & thirst), *Twakmamsayo Sthirikarana* (Gives firmness to skin & muscles), *Jwaraghna* (Relieves from fever), *Dipana* (Appetizer), *Pachana* (Digestive), *Stanya shodhana* (Purifies breastmilk), *Lekhana* (Scrapes away unwanted tissue), *Kleda, Meda, Vasa, Majja, Lasika, Puyasweda, Mutra, Mala Shoshaka* (Which dries up moisture, fats, muscle fat, bone marrow, lymph tissue, pus, sweat, urine and faeces), *Medhya* (Promotes intelligence) and *Kantha shodhana* (Clears the throat).

6. Kashaya Rasa (General Properties of Astringent Taste)

कषायो रसः संशमनः संग्राही सन्धानकरः पीडनो रोपणः शोषणः स्तम्भनः श्लेष्मरक्तपित्तप्रशमनः शरीरक्लेदस्योपयोक्ता रूक्षः शीतोऽलघुश्च ॥ च. सू. 26/43

कषायः संग्राहको रोपणः स्तम्भनः शोधनो लेखनः शोषणः पीडनः क्लेदो-पशोषणश्चेति ।
सु. सू. 43/10

कषायः पित्तकफहा गुरुरस्त्रविशोधनः । पीडनो रोपणः शीतः क्लेदमेदोविशोषणः ।
आमसंस्तम्भनो ग्राही रूक्षोऽर्ति त्वक्प्रसादनः ॥ अ. हृ. सू. 10/20-21

***Guna* (Qualities)**	***Doshakarma***
Ruksha, Shita, Alaghu (Guru)	*Pittakapha Shamaka Vata vardhaka*
Dhatukarma	*Sangrahi* (Constipative), *Sandhanakara* (Joins the fractured surfaces), *Ropana* (Heals up), *Shoshana* (Dries up), *Sharirakledopayukta* (Absorbs the fluid), *Lekhana* (Scrapes out unwanted tissues), *Asravishodhana* (Purifies the blood), *Artinashaka* (Relieves from pain).

8. *Rasatisevanajanya Vikara* (Diseases Due to Excessive Intake of Different *Rasa* Tastes)

1. Madhura Rasa Atisevanajanya Vikaras (Diseases Due to Excessive Intake of Sweet Taste)

स एवं गुणोऽप्येकं एवात्यर्थमुपयुज्यमानः स्थौल्यंमार्दवमालस्यमतिस्वप्नं गौरवमनन्नाभिलाष-मग्नेदौर्बल्यमास्यकण्ठयोर्मांसाभिवृद्धिं श्वासकास प्रतिश्यायालसक शीतज्वरानाहास्यमाधुर्य वमथुसंज्ञास्वरप्रणाशगलगण्डगण्डमाला श्लीपदगलशोफबस्तिधमनीगलोपलेपाक्ष्यामयाभिष्यन्दा-नित्येवं प्रभृतीन् कफजान् विकारानुपजनयति । च. सू. 26/43-1

स एवं गुणोऽप्येक एवात्यर्थमासेव्यमानः कासश्वासालसकवमथु वदनमाधुर्य-स्वरोपघातकृमिगलगण्डानापादयति तथार्बुदश्लीपदबस्तिगुदोपलेपाभिष्यन्दप्रभृतीन् जनयति ।

सु. सू. 42/12

कुरुतेऽत्युपयोगेन स मेदःश्लेष्मजान् गदान् । स्थौल्याग्निसादसंन्यासमेहगण्डार्बुदादिकान् ॥

अ. हृ. सू. 10/9

Doshakarma-Kaphakopana : When used in excess is to *Sthoulya* (Causes obesity), *Mardava* (Tenderness of body parts), *Alasya* (Laziness), *Atiswapna* (Excess sleep), *Gouravata* (Heaviness), *Anannabhilsha* (No interest towards food), *Agnidourbalya* (Loss of appetite), *Asyakanthayornamsabhivraddhi* (Excess muscular growth around mouth and throat), *Shwasa* (Breathlessness), *Kasa* (Cough), *Pratishyaya* (Cory-za), *Alasaka* (Intestinal torpor), *Shitajwara* (Fever preceded with cold), *Anaha* (Distension), *Asya Madhuryata* (Sweetness in mouth), *Vamathu* (Vomitting), *Sanjnanasha* (Loss of consciousness), *Swaraprananasha* (Loss or hoarseness of voice), *Gala-ganda & Gandamala* (Diseases related to thyroid), *Shlipada* (Elephantiasis), *Galashopha* (Pharyngitis), *Basti, Dhamani & Galopalepa* (Adhesion in the bladder, blood vessels & throat), *Akshyamaya Abhishyandi* (Produces conjunctivitis etc. eye disorders). Also produces different diseases originating from *Kapha Dosha*).

2. Amla Rasa Atisevanajanya Vikara (Diseases Due to Excessive Intake of Sour Taste)

स एवं गुणोऽप्येक रावात्यर्थमुपयुज्यमानो दन्तान् हर्षयति, तर्षयति, संमीलयत्यक्षिणी, संवेजयति लोमानि, कफं विलापयति, पित्तमभिवर्धयति, रक्तं दूषयति, मांसं विदहति, कायं शिथिलोकरोति, क्षीणक्षतदुर्बलानां श्वयथुमापादयन्ति, अपि च, क्षताभिहतदष्टदग्ध भग्नशूनप्रच्युतावमूत्रित-परिसर्पितमर्दितच्छिन्नभिन्नविश्लिष्टोद्विद्धोत्पिष्टदीनि पाचयत्याग्नेय स्वभावात् परिदहति कण्ठमुरो हृदयं च । च. सू. 26/43-2

स एवं गुणोऽप्येक एवात्यर्थमुपसेव्यमानोदन्तहर्षनयनसंमीलनरोमसंवेजन कफविलयन-शरीरशैथिल्यान्यापादयति तथा क्षताभिहतदग्धदष्ट भग्नशून रुग्णप्रच्युतावमूत्रितविसर्पितच्छिन्न-भिन्नविद्धोत्पिष्टादीनि पाचयत्याग्नेय स्वभावात् परिदहति कण्ठमुरो हृदयं चेति । सु. सू. 42/13

सोऽत्यभ्यस्तस्तनोः कुर्याच्छैथिल्यं तिमिरं भ्रमम् । कण्डूपाण्डुत्ववीसर्पशोफविस्फोट तृड्ज्वरान् ॥

अ. हृ. सू. 10/12

Doshakarma-Pitta Kapha Vardhaka : When used in excess *Dantan Harshayati* (Causes morbid sensation in teeth), *Tarshayati* (Burning sensation), *Samilayatyakshini* (Closure of eyes), *Samvejayati Lomani* (Horripulation), *Raktadushayanti* (Vitiates blood), *Mamsam Vidahati* (Burning sensation in muscular, tissues), *Kayam Shithili Karoti* (Causes

weakness), *Kshinakshata Durbalanam Shwayathumapadayati* (Causes swellings in the persons like emaciated, injured and weakened), *Kshatabhihatadashtadagdhabhagn apracyutavamutrita Parisarpita Marditachinnabhinnavishlishto Dwiddhot- pishtadini* (Causes suppuration of wounds caused by ulceration, trauma, contagious bites, burn, fracture, swelling, dislocation, poisonous urine, contact with poisonous animals, bruise, excision, incision, separation, perforation and crushing), *Paridahati Kanthamurohradayam* (Causes burning sensation in throat, chest and cardiac region). *Timira Bhrama* (Giddiness), *Kandu* (Itching sensation), *Pandutwa* (Anaemia), *Visarpa* (Herpes), *Visphota* (Boils) and *Jwara* (Fever).

3. Lavana Rasa Atisevanajanya Vikara (Diseases Due to Excessive Intake of Salt Taste)

स एवं गुणोऽप्येक एवात्यर्थमुपयुज्यमानः पित्तं कोपयति, रक्तं वर्धयति, तर्षयति, मूर्च्छयति, तापयति, दारयति, कुष्णाति मांसानि, प्रगालयति कुष्ठानि, विषं वर्धयति, शोफान् स्फोटयति, दन्ताश्च्यावयति, पुंस्त्वमुपहन्ति, इन्द्रियाण्युपरुणद्धि, वलिपलितखालित्यमापादयति, अपि च लोहितपित्ताम्लपित्तवीसर्पवातरक्तविचर्चिकेन्द्रलुप्तप्रभृतीन्विकारानुपजनयति । च. सू. 26/43

स एवं गुणोऽप्येक एवात्यर्थमासेव्यमानो गात्रकण्डुकोठशोफवैवर्ण्य पुंस्त्वोपघातेन्द्रियोपतापमुखाक्षिपाकरक्तपित्तवातशोणिताम्लीकाप्रभृतीनापादयति । सु. सू. 42/10-3

सोऽतियुक्तोऽस्रपवनं खलतिं पलितं वलिम् । तृट्कुष्ठविषवीसर्पान् जनयेत्क्षपयेद्बलम् ॥

अ. हृ. सू. 10/13-14

Doshakarma - Pitta Kapha Vardhaka : When salt is used in excess *Raktam Vardhayati* (Aggravation of *Raktadhatu*), *Tarshayati* (Causes thirst) *Murchayati* (Loss of conciousness), *Tapayati* (Burning sensation), *Darayati* (Causes erosion), *Kushnati Mamsani* (Vitiates muscle tissue), *Pragalayati Kushthani* (Formation of slough from skin lesions), *Visham Vardhayati* (Aggravates poisonous symptoms), *Shophan Sphotayati* (Bursting of inflamed region), *Dantan Scyavayati* (Dislodges teeth), *Pumstvamupahanti* (Reduces sexual strength), *Indriyanuparunaddhi* (Obstructs the normal functioning of sense organs), *Valipalita Khalitya-mapadayati* (Causes premature wrinkling, graying and baldness), *Lohitapittamlapittavisarpa Vatarakta- vicharchikandraluptaprabhratin Vikaran Janayanti* (Causes bleeding disorder, dyspepsia, herpes, gout, skin diseases, alopecia etc.). *Sushruta* adds some symptoms: *Kandu* (Itching all over the body), *Kotha* (Skin disease), *Vaivarnya* (Depigmentation), *Mukhakshipaka* (Ulcers in mouth & eye) etc.

4. Katu Rasa Atisēvanajanya Vikara (Diseases Due to Excessive Intake of Pungent Taste)

स एवं गुणोऽप्येक एवात्यर्थमुपयुज्यमानो विपाकप्रभावात् पुंस्त्वमुपहन्ति, रसवीर्यप्रभा-

वान्मोहयन्ति, ग्लापयति, सादयति, कर्शयति, मूर्च्छायति, नमयति, तमयति, भ्रमयति, कण्ठं परिदहति, शरीरतापमुपजनयति, बलं क्षिणोति, तृष्णां जनयति; अपि च वाय्वग्निगुणबाहुल्याद्भ्रमदवथु कम्पतोदभेदैश्चरणभुजपार्श्वपृष्ठप्रभृतिषु मारुतजान् विकारानुपजनयति । च. सू. 26/43-4

स एवं गुणोऽप्येक एवात्यर्थमुपसेव्यमानो भ्रममद गलताल्वोष्ठशोष दाह-संतापबलविधातकम्पतोद भेदकृत् करचरणपार्श्वपृष्ठप्रभृतिषु च वातशूलानापादयति ।

सु. सू.42/10-4

कुरुते सोऽतियोगेन तृष्णां शुक्रबलक्षयम् । मूर्च्छामाकुञ्चनं कम्पं कटिपृष्ठादिषु व्यथाम् ॥

अ. हृ. सू. 10/19

Doshakarma-Vatapittavardhaka : When *Katu* (Pungent) *Rasa* excessively used *Vipakaprabhavat Pumstvamupahanti* (Because of its *Vipaka* it reduces sexual capacity), *Rasavirya-prabhavanmohayanti* (Because of their taste & potency it causes unconsciousness). *Glapayati* (Discomfort), *Sadayati*(Numbness), *Karshayati* (Emaciation), *Murchayati* (Fainting), *Namayati* (Choking), *Tamayati* (Cuases giddiness), *Bhramayati* (Vertigo), *Kantham Paridahati* (Burning sensation in throat), *Shariratapamupajanayati* (Increases the body temperature), *Balam Kshinoti* (Diminishes strength), *Trashnam Janayati* (Produces thirst), *Vayvagnigunabahulyadwamathukampatodabhedais- charanabhyaparshwaprashta Prabhratishu Marutayan Vikaranupajanayati* (Because of predominance of *Vayu* & *Agni mahabhutas* it causes giddiness, burning sensation, tremors, pricking pain, stabbing pain, and pain in legs, arms, flanks, back etc. *Vataja* disorders) & *Shukra Kshaya* (Diminishes semen).

5. Tikta Rasa Atisēvanajanya Vikara (Diseases Due to Excessive Intake of Bitter Taste)

स एवं गुणोऽप्येक एवात्यर्थमुपयुज्यमानो रौक्ष्यात्खरविशदस्वभावाच्च रसरुधिरमांस-मेदोस्थिमज्जशुक्राण्युच्छोषयति, स्त्रोतसां खरत्वमुपपादयति, बलमादत्ते, कर्शयति, ग्लपयति, मोहयति, भ्रमयति, वदनमुपशोषयति, अपरांश्च वातविकारानु-पजनयति । च. सू. 26/43-5

स एवं गुणोऽप्येक एवात्यर्थमुपसेव्यमानो गात्रमन्यास्तम्भाक्षेपकार्दित शिरःशूलभ्रमतोदभेदच्छदास्यवैरस्यान्यापादयति । सु. सू. 42/10-5

धातुक्षयानिलण्याधीनतियोगात्करोति च । अ. हृ. सू. 10/16

***Doshakarma: Vata Vardhaka* :** When *Tikta* (Bitter) is used in excess singly, *Roukshyatkharavishada Swabhavaccha Rasarudhira-mamsa Medosthimajja-shukranyucchoshayati* (Because of its dryness, roughness and non-sliminess it depletes plasma, blood, muscle fat, bone-marrow and semen), *Srotasam Kharatwamupapadayati* (Produces roughness in channels), *Balamadatte* (Reduces strength), *Karshayati* (Causes

emaciation), *Glapayati* (Causes tiredness), *Mohayati* (Causes unconsciousness), *Bhramayati* (Cause giddiness), *Vadana-mupashoshayati* (Cause dryness of mouth), *Aparamscha Vata Vikaranupajanayati* (Produces diseases of *Vata Dosha*), *Gatramanya Stambha* (Stiffness all over the body & nape), *Akshepaka* (Tremors), *Ardita* (Facial paralysis), *Shirashula* (Head ache), *Asya Vairasya* (Distaste) & *Dhatukshayakaraka* (Depletes all the *Dhatu*).

6. *Kashaya Rasa Atisevana Janya Vikara (Diseases Due to Excess Intake of Astringent Taste)*

स एवं गुणोऽप्येक एवात्यर्थमुपयुज्यमान आस्यं शोषयति, हृदयं पीडयति, उदरमाध्मापयति, वाचं निगृह्यति, स्रोतांस्यवबध्नाति, श्यावत्वमापादयति, पुंस्त्वमुपहन्ति, विष्टभ्य जरां गच्छति, वातमूत्र पुरीषरेतांस्यवगृह्णाति, कर्शयति, रूपयति, तर्षयति, स्तम्भयति, खरविशदरुक्षत्वात् पक्षवधग्रहापतानाकार्दितप्रभृतींश्च वात विकारानुपजनयति । च. सू. 26/43-6

स एवं गुणोऽप्येक एवात्यर्थमुपसेव्यमानो हृत्पीडास्यशोषोदराध्मानवाक्यग्रहमन्यास्तम्भगात्र-स्फुरणचुमचुमामनाकुञ्चनाक्षेपणप्रभृतीञ्जनयति । सु. सू. 42/10

करोति शीलितः सोऽति विष्टम्भाध्मानहृद्रुजः । तृट्कार्श्यपौरुषभ्रंशस्रोतोरोधमलग्रहान् ॥

अ. हृ. सू. 10/21-22

Doshakarma : Vata Vardhaka : When astringent taste used in excess singly, *Asyam Shoshayati* (Causes dryness in mouth), *Hradayam Pidayati* (Discomfort in heart), *Udaramadhmapayati* (Distension of abdomen), *Vacham Nigrhnati* (Disturbance in speech), *Srotamsyavabadhnati* (Obstruction to *Srotas*), *Syavatvamapadayati* (Blackish dis-colouration of body parts), *Pumstvamupahanti* (Reduces sexual power), *Vishtabhya Jaram Gacchati* (Obstructs and gets digested slowly), *Vatamutra Purisharetamsyavagrahnati* (Cause obstruction to the passages of flatus, urine, faces and semen), *Karshayati* (Cause to emaciation), *Glapayati* (Tiredness), *Tarshayati* (Thirst), *Stambhayati* (Cause stiffness), *Kharavishadarukshatwat Pakshawadhagrahapatanakarata Prabhratimscha Vatavikaranupajanayati* (Because of its roughness, non-slimi-ness, dryness it causes various *Vatavyadhis* like hemiplegia, spasm, convulsions, facial paralysis etc. *Gatraspurana* (Pulsating sensation all over the body)] *Chumuchumayana* (Numbness).

9. *Rasa Gunanam Uttama, Madhyama, Adhamatwena Vyavastha* (Grading of *Rasa* (Tastes) with Special Reference to Their Qualities)

Rasa Guna (Qualities of Rasa)

Rasa itself is a *Guna,* it won't possess other qualities as per the reference from *Caraka Samhita.*

गुणा गुणाश्रया नोक्तास्तस्माद्रसगुणान् भिषक् । विद्याद्रव्यगुणान् कर्तुरभिप्रायाः पृथग्विधाः ॥
च. सू. 26/36

So, the qualities mentioned to the *Rasa* will be the qualities of *Dravya* itself. With a view of showing the relationship between *Rasa* and *Gurvadigunas,* the various qualities are attributed as the qualities of particular *Rasa.*

1. Madhura Rasa Guna (Qualities of Sweet Taste)

तत्र मधुरो रसः.........स्निग्धशीतो गुरुश्च । च. सू. 26/43-1

Madhura Rasa (Sweet taste) has the qualities like *Snigdha* (Unctuousness), *Shita* (Cold) & *Guru* (Heavy).

2. Amla Rasa Guna (Qualities of Sour Taste)

अम्लो रसो.........लघुरुष्णः स्निग्धश्च । च. सू. 26/43-2

Amla Rasa (Sour taste) has the qualities like *Laghu* (Lightness), *Ushna* (Hot) & *Snigdha* (Unctuousness).

3. Lavana Rasa Guna (Qualities of Salt Taste)

लवणो रसः.........नात्यर्थं गुरुः स्निग्ध उष्णश्च । च. सू. 26/43-3

Lavana Rasa (Salt taste) has the qualities like *Natyartaguru* (Not very heavy), *Snigdha* (Unctuous) & *Ushna* (Hot).

4. Kaṭu Rasa Guna (Qualities of Pungent Taste)

कटुको रसो.........लघुरुष्णो रुक्षश्च । च. सू. 26/43-4

Katu Rasa (Pungent taste) has the qualities like *Laghu* (light), *Ushna* (Hot) & *Ruksha* (Dryness).

5. Tikta Rasa Guna (Qualities of Bitter Taste)

तिक्तो रसः.........रूक्षः शीतो लघुश्च । च. सू. 26/43-5

Tikta Rasa (Bitter taste) has the qualities like *Ruksha* (Dryness), *Shita* (Cold) & *Laghu* (Light).

6. Kashaya Rasa (Qualities of Astringent taste)

कषायो रसः.........रूक्षः शीतोऽलघुश्च । च. सू. 26/43-6

Kashaya Rasa (Astringent taste) has the qualities like *Ruksha* (Dryness), *Shita* (Cold), *Alaghu* (Not very light).

* *Ashtanga Sangrahakara* attributed *Mradu Guna* to *Madhura Rasa, Tikshna Guna* to *Lavana Rasa, Natiruksha* to *Tikta Rasa* and *Atiruksha* to *Kashaya Rasa.*

Table depicting *Shaṭ Rasa Guna* (Qualities of six tastes)

Sl. No.	*Rasa* (Taste)	*Guṇa* (Qualities)
1	*Madhura* (Sweet)	*Snigdha, Shita, Guru*
2	*Amla* (Sour)	*Laghu, Ushna, Snigdha*
3	*Lavana* (Salt)	*Natiguru, Snigdha, Ushna*
4	*Katu* (Pungent)	*Laghu, Ushna, Ruksha*
5	*Tikta* (Bitter)	*Ruksha, Shita, Laghu*
6	*Kashaya* (Astringent)	*Ruksha, Shita, Alaghu*

Sushruta* explains briefly regarding the qualities of *Rasa

तत्र मधुराम्ललवणाः स्निग्धा गुरवश्च, कटुतिक्तकषाया रूक्षा लघवश्च, सौम्याः शीताः आग्नेया उष्णाः । सु. सू. 42/7

Madhura, Amla and *Lavana Rasa* will have *Snigdha* (unctuousness) and *Guru* (Heavy) *Gunas* whereas *Katu, Tikta* and *Kashaya Rasas* will have *Ruksha* (Un unctuousness) and *Laghu* (Light). *Sowmya* (Mild) *Rasas* are having *Shita* (Cold) quality where as *Agneya* (Strong) *Rasas* have *Ushna* (Hot) quality.

* Difference between the qualities attributed to *Amla* and *Kashaya* may be noticed among *Caraka* and *Sushruta.*

10. *Taratamata of Rasa* (Relative Superiority of Taste Based on Quality)

रौक्ष्यात् कषायो रूक्षाणामुत्तमो मध्यमः कटुः । तिक्तोऽवरस्तथोष्णानामुष्णत्वाल्लवणः परः ॥ मध्योऽम्लः कटुकश्चान्त्यः स्निग्धानां मधुरः परः । मध्योऽम्लो लवणश्चान्त्यो रसः स्नेहन्निरुच्यते ॥ मध्योत्कृष्टावराः शैत्यात् कषायस्वादुतिक्तताः । स्वादुर्गुरुत्वाधिकः कषायाल्लवणोऽवरः ॥ अम्लात् कटुस्ततस्तिक्तो लघुत्वादुत्तमोत्तमः । केचिल्लघुनामवरमिच्छन्ति लवणं रसम् । गौरवे लाघवे चैव सोऽवरस्तुभयोरपि ॥ च. सू. 26/53-56

Table showing superiority of *Rasa* w.s.r. *Guna*

Sl. No.	*Guna* (Qualities)	*Uttama* (Best)	*Madhyama* (Moderate)	*Avara* (Inferior)
1	*Ruksha* (Dryness)	*Kashaya*	*Katu*	*Tikta*
2	*Snigdha* (Unctuousness)	*Madhura*	*Amla*	*Lavana*
3	*Ushna* (Hot)	*Lavana*	*Amla*	*Katu*
4	*Shita* (Cold)	*Kashaya*	*Madhura*	*Tikta*
5	*Guru* (Heaviness)	*Madhura*	*Kashaya*	*Lavana*
6	*Laghu* (Lightness)	*Tikta*	*Katu*	*Amla*

11. *Raseshu Doshadushyanam Shamanatwa* (Effect of *Rasa* on *Dosha*-Alleviation & Aggravation)

Dosha Shamanatwa (Alleviation of *Dosha*)

स्वाद्वम्ल लवणा वायुं, कषाय स्वादुतिक्तकाः । जयन्ति पित्तं, श्लेष्माणं कषाय कटुतिक्तकाः ॥

च. सू. 1/66

तत्र दोषमेकैकं......त्रयस्त्रयश्चोपशमयन्ति । तद्यथा......मधुराम्ललवणास्त्वेन शमयन्ति; ......मधुरतिक्तकषायास्त्वेन शमयन्ति; ......मधुरतिक्तकषायास्त्वेन शमयन्ति; ......श्लेष्माणं...... कटुतिक्तकषायास्त्वेनं शमयन्ति । च. वि. 1/6

तत्र मधुराम्ललवणा वातघ्नाः मधुरतिक्त कषायाः पित्तघ्नाः, कटुतिक्तकषायाः श्लेष्मघ्नाः ।

सु. सू. 42/4

तत्राद्यामारुतं घ्नन्ति त्रयस्तिक्तादयः कफम् । कषाय तिक्तमधुराः पित्तमन्ये तु कुर्वते ॥

अ. हृ. सू. 1/25

Based on their alleviating action on *Dosha,* the *Rasa* can be categorised under three groups.

Vata Shamaka Rasa-Madhura, Amla & Lavana
Pitta Shamaka Rasa-Kashaya, Tikta & Madhura
Kapha Shamaka Rasa-Katu, Tikta & Kashaya

Dosha Kopanatwa (Aggravation of *Dosha*)

तत्र दोषमेकैकं त्रयस्त्रयो रसा जनयन्ति, ... । तद्यथा-कटुतिक्तकषाया वातं जनयन्ति, ...; कट्वम्ललवणाः पित्तं जनयन्ति, ...; मधुराम्ललवणाः श्लेष्माणं जनयन्ति, ... ।

च. वि. 1/6

कट्वम्ललवणाः पित्तं, स्वाद्वम्ललवणाः कफम् । कटुतिक्तकषायाश्च कोपयन्ति समीरणम् ॥

पाठान्तर-योगीन्द्रनाथ सेन

Based on aggravating action on *Dosha,* the *Rasa* can be grouped under three categories.

Vata Kopaka Rasa-Katu, Tikta & Kashaya
Pitta Kopaka Rasa-Katu, Amla & Lavana
Kapha Kopaka Rasa-Madhura, Amla & Lavana

Chart showing action of individual *Rasa* on individual *Dosha:*

Sl. No.	Name of the *Rasa*	*Vata*	*Pitta*	*Kapha*
1	*Madhura*	*Shamaka*	*Shamaka*	*Vardhaka*
2	*Amla*	*Shamaka*	*Vardhaka*	*Vardhaka*

3	*Lavana*	*Shamaka*	*Vardhaka*	*Vardhaka*
4	*Katu*	*Vardhaka*	*Vardhaka*	*Shamaka*
5	*Tikta*	*Vardhaka*	*Shamaka*	*Shamaka*
6	*Kashaya*	*Vardhaka*	*Shamaka*	*Shamaka*

12. *Rasa Prayoga* as *Aushadha* (Utility of Six tastes as Medicine)

In *Kashyapa Samhita* elaborate description has been given about the particular order of *Rasas* which are to be used in different stages of *Vyadhis* originated from different *Doshas.*

Order of Rasa in Case of Kapha Vyadhi

कटुतिक्तकषायांस्तु रसान् प्राज्ञो यथाक्रमम् । योगतः कफजे व्याधौ भैषज्यमवचारयेत् ॥
प्रयुक्तः कटुकः पूर्वं पैच्छिल्यं गौरवं च यत् । श्लेष्मणस्तं निहन्त्याशु तिक्तस्तस्मादनन्तरम् ॥
ह्रासयत्सास्य माधुर्य कफं संशोषयत्यपि । संग्रहणति कषायश्च स्नेहं चाप्यवकर्षति ॥

काश्यप स. खिलस्थान 6/24-27

Skilful *Vaidya* will administer *Katu, Tikta* and *Kashaya Rasa Yukta Dravyas* in order in diseases originated from *Kapha Dosha.*

- *Katu Rasa Dravya* to be used first, if it is administered it reduces *Paichilyata* (Sliminess) and *Gauravata* (Heaviness).
- Secondly *Tikta Rasa Dravyas* should be used as it relieves *Mukha Madhuryata* (Sweetness in mouth) and dries up the *Kapha.*
- Thirdly *Kashaya Rasa Dravyas* are to be administered; it thickens the *Kapha* and removes *Snehamsha* (Oiliness).

Order of Rasa in Case of Pittaja Vyadhi

तिक्तस्वादुकषायाः स्युः क्रमशः पैत्तिके हिताः । आमान्वयत्वात् पित्तस्य पूर्वं तिक्तोऽवचारितः ॥
पाचयत्याशु तं पक्वं ततस्तु मधुरो रसः । शैत्यात् गुरुत्वात् स्नेहाच्च माधुर्याच्च नियच्छति ॥
तदद्रवत्वविघातार्थं कषायाश्चावचारितः । रौक्ष्याद्विशोषिभावाच्च विशोषयति तैजसम् ॥

का. स. खि. 6/27-30

In case of *Pittaja Vyadhis Tikta, Madhura* and *Kashaya Dravyas* are to be used in order.

- *Tikta Rasa Dravyas* will do *Āma Pachana* when it is used at the beginning.
- Then *Madhura Rasa Dravya* takes care of *Pitta Prakopa* by subsiding its *Ushna* and *Laghu Guna* as *Madhura* is *Shita* and *Guru.*

- Lastly *Kashaya Rasa* to be administered, owing to its *Raukshatwa* it dries up *Drava Guna* of *Pitta* and does *Shoshana.*

Order of Rasa in Vataja Vyadhi

वातिके क्रमशो योज्याः पट्वम्लमधुराः रसाः । वातिके लवणः पूर्वं संयोगादवचारितः ।
प्रक्लेदिभावाज्जयति विबन्धं मातरिश्वनः ॥ निहन्तिशैत्यमुष्णत्वात् गुरुत्वच्चापि लाघवम् ।
तथैवाम्लो रसः पश्चात्तस्मिन्नेवावचारितः ॥ जड़ीकृतानि स्त्रोतांसि तैक्ष्ण्यादुद्धाच्य मारुतम् ।
अनुलोमयति क्षिप्रं स्निग्धोष्णात्वाद्धिमार्गगम् ॥ अम्लादनन्तरं पश्चात् प्रयुक्तो मधुरो रसः ।
वायोर्लघुत्वं वैशद्यं रुक्षत्वं च व्यपोहति ॥ गुरुत्वात् पिच्छिलत्वाच्च स्निग्धत्वाच्च यथाबलम् ।
इत्युक्ताः सर्वदोषेषु रसानां प्रविचारणाः ॥ का. स. खि. 6/30-35

In *Vataja Vyadhis* the order of administration of *Rasa Dravyas* should be *Lavana, Amla* and *Madhura.*

- Initially if *Lavana Rasa Dravya* is used it relieves *Vibandhata* because of its *Prakledi Guna,* reduces *Śaityata* owing to its *Ushna* quality and relieves *Laghuta* due to its *Guru Guna.*
- Then *Amla* if used because of its *Tikshna, Snigdha* and *Ushna* it relieves *Sroto Avarodha* and brings back the *Vata Dosha* to its normal pathway.
- Lastly *Madhura Rasa Dravya* is to be administered. Because of its *Guru, Picchila* and *Snigdha* qualities it reduces *Laghu, Vishada* and *Ruksha Guna* of *Vata.*

13. *Rasa Prayoga* as *Ahara* (utility of six taste as a food)

Our *Acharyas* have emphasized the order of intake of *Rasa* while consuming food.

पूर्वं मधुरमश्नीयान्मध्येऽम्ललवणौ रसौ । पश्चाच्छेषान् रसान् वैद्यो भोजनेष्ववचारयेत् ॥

सु. सू. 46/460

पूर्वमित्यादि । बुभुक्षिते पुरुषे वातपित्तप्रशमनाय प्रथमं मधुरो रसः पक्वाशयगतं वायुं जयति, अम्ललवणौ मध्यभोजनस्थौ पित्ताशये अग्निदीप्तिं कुरुतः, अन्ते कफजयाय कट्वादयः ।

डल्हण भाष्य-सु. सू. 46/460

Sushruta insisted upon the order of *Rasa* that one has to follow during the intake of food.

Sl. No.	*Avastha*	*Rasa Dravya*
1	*Prathama*	*Madhura Rasa Dravyas*
2	*Madhyama*	*Amla & Lavana Rasa Dravyas*
3	*Antima*	*Katu, Tikta & Kashaya Rasa Dravyas*

If a person is hungry, first one has to consume *Madhura Rasa Dravyas* in order to calm down *Vata* & *Pitta*. In the middle stage one has to take *Amla* and *Lavaṇa Rasa Dravyas* to increase the appetite and at the end one has to go for *Katu, Tikta* & *Kashaya Rasas* to tackle *Kapha* which will be increased after taking food.

लवणाम्ल कटूष्णानि विदाहीन्यति यानि तु । तद्धोषं हर्तुमाहारं मधुरेण समापयेत् ॥

भा. प्र. 5/164

Bhavamishra is of the opinion that one has to end his food by consuming *Madhura Rasa* which overcomes *Vidaha* caused by *Ushna Guna Yukta Rasas* like *Lavana, Amla* and *Katu.*

Before taking particular *Rasadravyas* the person should assess his *Agni.* Depending on the condition of *Agni* one can change the order.

भोजनाग्रे सदापथ्यं लवणार्द्रक भक्षणम् । अग्निसंदीपनं रुच्यं जिह्वा कण्ठ विशोधनम् ॥

भा. प्र. 5/130

Bhavamishra opines that the person having *Kshinagni* should consume *Saindhava Lavana* with *Ardraka.* Which increases the appetite and improves the taste by cleaning *Jihwa* (Tongue) and *Kantha* (Throat).

14. Clinical application of Shad Rasa & Research updates on Rasa

Clinical Application

Knowledge of Six tastes is very much beneficial for the clinical management of diseases. Very selection of the drugs is mainly based on the tastes which it possesses. Each taste is having its action on Tridosha may be in the form of pacifying or aggravating. The diseases are the out come of vitiation of one single *dosha* or two *doshas* or vitiation of all the three *doshas*. Utilizing particular drug in particular disease condition brings the success hence the knowledge on concepts of *Rasa* is much necessary for the successful practitioner. For example; in case of *Vata vyadhi* using *Dravyas* having *Lavana, Amla* & *Madhura* in order is much beneficial.

Ahara (food) is also very important sector which is to be given much importance as it is responsible for manifestation of the diseases. If a person knows to consume food as per the requirement based on the tatse may not suffering with the diseases. And also during the treatment of diseases it is necessary to advise *Pathya* (conducive) and *Apathya* (non conducive) items to the patient so that the treatment becomes successful.

Eventhough it is the *Virya* which is considered as responsible factor for the particular *Karma* (Pharmacological actions) but in certain incidences it is the *Rasa* (Taste) brings about the *Karma*. For example, *Jwaraghna* (Antipyretic) action of *Guduchi* (*Tinospiora cordifolia*) is attributed to its *Tikta Rasa* (Bitter taste).

Research Methods

I. Assessment of Rasa

A. Detection of Rasa: Using questionnaire method

a. Aim : To determine the *rasa* of the given drug using questionnaire method.

b. Materials : Drug Sample - Fine powder

c. Principle : On placing the drug in the mouth, the perception of taste is felt which results in *Rasa Lakshana* and *Karma*. The assessment of these *Lakshana* and *Karma* was done by utilizing *Pratyaksha pramana*.

d. Procedure : A questionnaire was prepared by compiling the *Rasa Lakshana* and *Karmas* explained in the *Ayurvedic* classics such as *Charaka Samhita, Sushruta Samhita, Ashtanga Sangraha, Ashtanga Hradaya, Rasavaiseshika, Harita Samhita, Bhavaprakasa Nighantu, Sodala Nighantu, Madanapala Nighantu* and *Raja Nighantu*. The questionnaire consists of questions related to all 6 Rasa *Madhura Rasa* (54 *Lakshana*), *Amla Rasa* (51 *Lakshana*), *Lavana Rasa* (41 *Lakshana*), *Katu rasa* (75 *Lakshana*), *Tiktha rasa* (58 *Lakshana*), *Kashaya rasa* (54 *Lakshana*) respectively.

- 10 healthy volunteers were selected for the evaluation.
- Each volunteer was given 3 gram of fine powder of drug without revealing the identity of the drug.
- The participants were advised to have their food one and half hour before the starting of experiment and were also advised not to fast.
- At first, they were instructed to rinse their mouth thrice with water and then to keep the powdered drug in mouth for 10 minutes to perceive the taste of the drug.
- The participants were asked to spit out the drug and hold it without washing and were asked to observe the *Lakshanas*.
- Assessment was done using the questionnaire.
- The signs and symptoms perceived by the individuals while keeping the drug in mouth and that persist for 10 minutes thereafter were also noted.
- Percentage of each *Rasa* was calculated for both the *choornas* separately by using the Formula.

$$\text{Percentage of each } Rasa = \frac{\text{Total no of specific rasa lakshana experienced}}{\text{Total lakshana mentioned in } Ayurvedic \text{ classics for specific ras x total number of volunteers}} 100$$

Inference: The highest lakshanas of the particular Rasa perceived by maximum

participants will be considered as Pradhana Rasa (Primary Taste) and rest will be Anurasa (Secondary Taste).

B. Detection of degree of variation *(Taratamatwa)* of Rasa: Taste threshold method

a. Aim : To determine the degree of variation (*Taratamatwa*) in *Rasa* of given drug.

b. Materials

- Drug sample
- Distilled water
- Stirrer
- Filter paper
- Beaker.

c. Principle : Taste threshold is the minimum concentration of a substance necessary to arouse a taste sensation. Based on this principle a standardized procedure was developed, where distilled water was added gradually to the aqueous extract of the drug and the dilution of the solution at which taste was last perceived was taken as the taste threshold of that taste in the drug.

d. Procedure :

- 5 gram of fine powder of the drug was mixed in 100 ml of distilled water taken in a beaker and stirred well for 30 min.
- It was then filtered using a filter paper.
- Test was conducted without revealing the identity of the drug.
- A total of 12 healthy volunteers were divided into 4 groups of 3 individuals each.
- The solution was given to the volunteers after one and half hour after intake of breakfast.
- They were instructed to rinse their mouth thrice with water.
- 1ml of extract was diluted with 1ml distilled water and was given to the first group and perception of taste of each individual was noted.
- If they perceive the taste the dilution was increased by mixing 1 ml of extract with 2 ml of distilled water and given to second group.
- Like-wise the quantity of distilled water was gradually increased and given to third group and if they perceived the taste, it was then given to the fourth group.
- The next dilution was administered after a period of one hour and the first group was utilized.
- Subsequently, the quantity of dilution was increased to 2ml, followed by 3ml likewise it was increased.

- The procedure of dilution continued until the taste of the drug disappears.
- The dilution at which taste was last perceived just before the disappearance of taste was noted.

Inference: The quantity of the distilled water used till disappearance of the taste from mouth suggests the degree of variation (*Taratamyata*). More the quantity of water used then more the threshold of taste.

Research Updates

1. Reshmi Pushpan and K. Nishtewsar. *Rasa Nirdharana* (assessment of taste) of *Leonotis nepetifolia* (L.) R. Br.: A preliminary study in healthy volunteers. Anc Sci Life. 2014 Jan-Mar; 33(3): 186–191. doi: 10.4103/0257-7941.144625

Rasa (a concept corresponding to taste) is the only perceivable parameter for drug identification in Ayurveda. The Ayurvedic pharmacological principles such as *guna* (quality), *virya* (potency) and *vipaka* (effect of biotransformation) are inferred based on the identified *Rasa* of a drug. All these principles together predict the probable spectrum of drug action in Ayurveda.

The whole plant powder (3g) of *Leonotisnepetifolia* was administered to 50 participants (trained Ayurvedic physicians) and their responses after intake of the drug were elicited using a structured questionnaire.

Those characteristics which are local or reflex reactions experienced on the tongue, buccal cavity, throat, palate, nose and eyes described in the context of characteristics of *rasa* in *Caraka samhita*, *Sushrutasamhita*, *Astangasangraha*, *Astangahridaya* and *Bhavaprakasha* were incorporated into a structured questionnaire. Individually 2, 4, 3, 5, 2 and 3 characteristics were identified and attributed for *madhura*, *amla*, *lavana*, *katu*, *tikta* and *kashaya rasas* respectively. The characteristic, "causes salivation" is common to *Amla*, *Lavana* and *Katurasa*

Procedure of administration of questionnaire

The participants who volunteered for the study were explained about the study and their role in the study. Every volunteer was then asked to cleanse their mouth with water prior to the onset of the experiment. Five minutes after cleansing the mouth they were given 3 g of the test drug and asked to record their inputs in the questionnaire.

A total of 50 volunteers (19 females and 31 males) aged between 25 – 35 years participated in the study. Data shows the highest frequency in the characteristics of *Tikta rasa* (47) as experienced by the respondents followed by those of *Kacshya rasa* (37) and *Katurasa* (34) respectively.

2. Marilena Gilca and Dorin Dragos Extraoral Taste Receptor Discovery: New

Light on Ayurvedic Pharmacology. Evid Based Complement Alternat Med. 2017; 2017: 5435831. Published online 2017 May 31. doi: 10.1155/2017/5435831

The functional implications of these taste receptors widely dispersed in various organs or tissues shed a new light on several concepts used in ayurvedic pharmacology (*dravyaguna vijnana*), such as taste (*rasa*), postdigestive effect (*vipaka*), qualities (*guna*), and energetic nature (*virya*). This review summarizes the significance of extraoral taste receptors and transient receptor potential (TRP) channels for ayurvedic pharmacology, as well as the biological activities of various types of phytochemical tastants from an ayurvedic perspective.

Concerning the number of taste modalities, modern science recognized five (sweet, bitter, salty, sour, and umami), while Ayurveda six (*Madhura*: sweet, *Lavana*: salty, *Amla*: sour, *Katu*: pungent, *Tikta*: bitter, and *Kashaya*: astringent).

The sense of taste is governed by distinct cell types located in the taste buds that express only one type of specific taste receptor (TR). There are four categories of taste bud cells: type I, type II, type III, and type IV. Type II cells (or receptor cells) are involved in bitter, sweet, and umami detection, while type III (or presynaptic cells) in sour taste perception . It is not yet clear whether type I (glial-like supporting cells similar to astrocytes) or type III cells (presynaptic cells) play the main role in salty taste perception . Type IV cells are basal cell type, responsible for renewal of taste bud cells and mechanoreception.

Extraoral Distribution of Taste Receptors

More and more evidence shows that the localization of taste receptors is not restricted to oral cavity, not even to certain tissues/organs, but rather evenly distributed over the entire body. Even if not all extraoral sites express TRs at levels comparable to taste tissue, this wide distribution suggests that TRs may have functional roles far beyond the original concept of taste perception.

Scientists suggested that these extraoral taste cell-related elements that are mainly solitary or clustered cells, not grouped in buds, may be part of a large *diffuse chemosensory system* (DCS), compared with an iceberg, the taste buds representing only the most visible portion, while the extraoral taste cells are the larger "submerged" part.

15. *Rasa* and *Anurasasya Bheda*

व्यक्तः शुष्कस्य चादौ च रसो द्रव्यस्य लक्ष्यते । विपर्ययेणानुरसो रसो नास्तीह सप्तमः ।

च. सू. अ. 26

भाष्य–व्यक्त इत्यादि । शुष्कस्य चेति चकरादार्द्रस्य च, आदौ चेति चकरादन्ते चः तेन शुष्कस्य वाऽऽर्द्रस्य वा प्रथम जिह्वासम्बन्धे वाऽऽस्वादान्ते वा यो व्यक्तत्वेन मधुरोऽयमम्लोऽयमित्यादिना

विकल्पेन ग्रह्यते, स रसः, यस्तुक्तावस्थाचतुष्टयेऽपि व्यक्तो नोपलभ्यते, किं तर्ह्यव्यपदेश्यतया छायामात्रेण कार्यदर्शनेन वा मीयते, सोऽनुरस इति वाक्यार्थः । चक्रपाणिदत्त

तत्र व्यक्तो रसः । अनुरसस्तु रसेनाभिभूतत्वादव्यक्तो, व्यक्तो व किंचिदन्ते । अ. सं. सू. 17

तत्र च द्रव्ये रसेनेन्द्रियग्राह्यो व्यक्तः स्फुटो 'रस' शब्देनोक्तः । इन्दु भाष्य–अ. सं. सू. 17

तत्र व्यक्तो रसः स्मृतः । अव्यक्तोऽनुरसः किञ्चिदन्ते व्यक्तोऽपि चेष्यते । अ. हृ. सू. 9

भाष्य–तत्र द्रव्ये, कश्चिद्धर्मः सद्यो व्यक्तः, कश्चिदव्यक्तः कश्चिदीषद् व्यक्तः कश्चिदन्ते व्यक्तः । तेष्वाद्यो रसाख्यः, इतरे त्रयोऽनुरसाख्याः । हेमाद्रि

The *Rasa* (Primary taste) is perceived immediately on consumption of the *Dravya* and remains stable even in its dry state.

Anurasa (Secondary taste) on the other hand is one which is perceived after the perception of the primary taste and is not stable in its dry state and not easy to perceive distinctly.

Rasa is vividly or clearly perceived whereas *Anurasa* is obscure.

Hence there are only 6 *Rasas* and not seven.

E.g. 1. *Chitraka(Plumbago zeylanica)* whose *Rasa* is *Katu* in fresh form continues to remain *Katu* in its dry form. i.e. *Rasa* is stable both in fresh & dry states.

2. *Amalaki (Emblica officinalis)* has *Pancha Rasa* (Five tastes). But it is *Amla Rasa* which is perceived immediately on consumption and hence considered as *Pradhana* (Primary) while others i.e. *Madhura, Kaṭu, Tikta & Kashaya* are *Anurasas.*

3. *Pippali* in its fresh state has *Madhura Rasa* but on drying transforms into *Kaṭu Rasa* which is perceived first.

Table showing the difference between *Rasa* & *Anurasa*.

Sl.No.	*Rasa*	Sl. No.	*Anurasa*
1.	Primary taste	1.	Secondary taste
2.	Perceived immediately	2.	Perceived later
3.	Perceived distinctly	3.	Not perceived distinctly
4.	Perceived completely	4.	Perceived partly
5.	Remains stable in dry state also	5.	Not stable in dry state

Excercises: Multiple Choice Questions (MCQ)

1. Pippali and Maricha are the examples for

   a. Madhura Rasa b. Katu Rasa c. Amla Rasa d. Kashaya Rasa

   Ans: b. Katu Rasa

2. Madhura Rasa has predominance of which Mahabhuta

   a. Ap & Prithvi b. Prithvi & Agni
   c. Ap & Agni d. Agni & Vayu

   Ans: a. Ap & Prithvi

3. Pancha Mahabhuta Pradhanyata of Lavana Rasa

   a. Ap & Prithvi b. Prithvi & Agni
   c. Ap & Agni d. Agni & Vayu

   Ans: c. Ap & Agni

4. Panchamahabhuta Pradhanyata of Kashaya Rasa

   a. Prithvi & Agni b. Ap & Prithvi c. Ap & Agni d. Vayu & Prithvi

   Ans: d. Vayu & Prithvi

5. Perception of Tikta Rasa of Kirata Tikta by Rasanendriya is an example for

   a. Anumana b. Pratyaksha c. Aptopadesha d. Upamana

   Ans: b. Pratyaksha

6. Meatiness or savoriness taste found in fermented food is known as

   a. Umami b. Sourness c. Bitterness d. Saltiness

   Ans: a. Umami

7. Vata Shamaka Rasas

   a. Madhura Katu Kashaya b. Madhura Tikta Kashaya
   c. Madhura Amla Lavana d. Madhura Amla Katu

   Ans: c. Madhura Amla Lavana

8. Pitta Shamaka Rasas

   a. Katu Amla Lavana b. Katu Tikta Kashaya
   c. Amla Lavan Kashaya d. Madhura Tikta Kashaya

   Ans: d. Madhura Tikta Kashaya

9. Kapha Shamaka Rasas

   a. Katu Madhura Lavana b. Katu Amla Lavana
   c. Katu Tikta Kashaya d. Lavana Madhura Amla

   Ans: c. Katu Tikta Kashaya

10. Vata Kopaka Rasas
    a. Katu Tikta Kashaya b. Katu Madhura Lavana
    c. Madhura Amla Lavana d. Katu Madhura Amla
    Ans: a. Katu Tikta Kashaya
11. Pitta Kopaka Rasas
    a. Madhura Tikta Kashaya b. Amla Lavana Katu
    c. Madhura Amla Katu d. Madhura Kashaya Katu
    Ans: b. Amla Lavana Katu
12. Kapha Kopaka Rasas
    a. Katu Madhura Lavana b. Katu Tikta Kashaya
    c. Madhura Amla Lavana d. Madhura Katu Kashaya
    Ans: c. Madhura Amla Lavana
13. Dantaharsha and Mukhasrava are the lakshanas of
    a. Katu b. Amla c. Tikta d. Kashaya
    Ans: b. Amla
14. Bhaktaruchimutpadayati is the lakshana of
    a. Amla b. Katu c. Lavana d. Kashaya
    Ans: c. Lavana
15. The taste which doesn't allow perception of other tastes
    a. Amla b. Katu c. Madhura d. Tikta
    Ans: d. Tikta
16. Badhnativa Cha Ya Kantham refers to
    a. Madhura b. Lavana c. Kashaya d. Katu
    Ans: c. Kashaya
17. Ajanma Satmya Rasa as per Vagbhata is
    a. Lavana b. Madhura c. Kashaya d. Katu
    Ans: b. Madhura
18. Sarva Rasa Pratyanikabhuta as per Sushruta
    a. Katu b. Madhura c. Amla d. Lavana
    Ans: d. Lavana
19. Sangrahaka is a Karma attributed to
    a. Amla b. Lavana c. Kashaya d. Madhura
    Ans: c. Kashaya

20. Sthoulya is Atisevanajanya Vikara of

    a. Katu b. Madhura c. Kashaya d. Tikta

    Ans: b. Madhura

21. Laghu Ushna Snigdha are the Gunas of

    a. Amla b. Katu c. Madhura d. Kashaya

    Ans: a. Amla

22. Ruksha Shita Laghu Gunas are present in

    a. Amla b. Lavana c. Tikta d. Madhura

    Ans: c. Tikta

*****

5 Chapter

Vipaka Vijnana

Contents

1. *Vipaka Lakshana* (Characteristics of Vipaka)
2. *Trividha Vipaka Vada* (Three types of *Vipaka*)
3. *Dwividha Vipaka Vada* (Two types of *Vipaka*)
4. *Vipaka Guna Karma* (Properties and actions of Vipaka)
5. *Vipaka Taratamya* (Grading of *Vipaka*)
6. *Vipaka Upalabdhi Hetu* (Assessment of *Vipaka*)
7. *Rasa Vipaka yorbheda* (Differences between *Rasa* & *Vipaka*)
8. Clinical Application and Research updates

1. *Vipaka Lakshana* (Characteristics of *Vipaka*)

जाङ्गरेणाग्निना योगाद्यदुदेति रसान्तरम् । रसानां परिणामान्ते स विपाक इति स्मृतः ॥

अ. हृ. सू. 9/20

The final outcome of *Rasa* transformation under the influence of *Jatharagni* is called *Vipaka.*

रसानां-रसवतां द्रव्याणां जाठराग्निना संयोगात् यद्रसान्तरमुत्पद्यते स विपाक ।

आ. र.-अ. हृ. सू. 9/20

Hemadri, commentator on *Ashtanga Hradaya* also support the views of *Vagbhata.*

विपाकं लक्षयति । जाठरेण औदर्येण अग्निना, योगात् संश्लेषात्, रसानां परिणामान्ते जरणनिष्ठाकाले, यद् रसान्तरं रसविशेषः उदेति उत्पद्यते, स 'विपाक' इति स्मृतः मुनिभिः कथितः ।

सर्वाङ्गसुन्दरि-अरुणदत्त 9/20

Arunadatta is also of the opinion that the transformation of *Rasa* which takes place at the end of *Jatharagni Paka* is known as *Vipaka.*

अवस्थापाकापेक्षया विशिष्टः पाको विपाकः । शिवदास सेन-सु. सू. 40/10

Shivadasa Sen goes a step further and says that *Vipaka* is different from *Avasthapaka.*

जठराग्नियोगादाहारस्य निष्ठाकाले यो गुण उत्पद्यते स विपाकः । चक्रपाणि-च. सू. 26/57-58

The quality obtained after the completion of digestion is known as *Vipaka.*

पाकः पचनं द्रव्याणां स्वरूपरसयोः परावृत्तिः । सा च स्वरूपात्तरत्वेन रसान्तरत्वेन च परिणतिः तस्य विशेषो विपाकः । गङ्गाधर-च. सू. 26/57-58

Gangadhara says that digestion of *Dravya* results in the transformation of *Swarupa* and *Rasa* of the *Dravya*. This special transformation of *Rasa* of a *Dravya* under the influence of *Agni* (*Paka*) is called *Vipaka*.

विशिष्ट पाको विपाकः, न पाकमात्रस्वरूपः । हेमाद्रि-अ. हृ. सू. 1/17

Hemadri is also of the same opinion that the special *Paka* happening is known as *Vipaka*.

2. *Trividha Vipaka Vada* (Three Types of *Vipaka*)

कटु तिक्त कषायाणां विपाकः प्रायशः कटुः । अम्लोऽम्लं पच्यते, स्वादुर्मधुरं लवणस्तथा ॥

च.सू. 26/57-58

संप्रति विपाकस्यपि रसरुपत्वाल्लक्षणमाह-परमित्यादि । प्रायोग्रहणात् पिप्पलीकुलत्थादीनां रसाननुगुणपाकितां दर्शयति । कटुकादिशब्देन च तदाधारं द्रव्यमुच्यते; यतो न रसाः पच्यन्ते, किंतु द्रव्यमेव । लवणस्तथेति मधुरविपाकः प्राय इत्यर्थः ।चक्रपाणि भाष्य-च. सू. 26/57-58

Caraka proposed *Trividha Vipaka Vada* and says that probably *Katu, Tikta & Kashaya Dravyas* undergo *Katu Vipaka, Amla Rasa Dravya* undergo *Amla Vipaka* and *Madhura* to *Madhura Vipaka*.

Cakrapani explains *Trividha Vipaka* with few examples like *Pippali* which has *Katu Rasa* but undergo *Madhura Vipaka* and says this may be the probable reason to *Caraka's* reference of *'Prayaha'*. Even *Kulatha* is also an exception that has *Kashaya Rasa* but will undergo *Amla Vipaka*. But finally, he says whatever the *Vipaka* may be; it will be of three types, viz. *Madhura, Amla* and *Lavana*.

त्रिधा विपाको द्रव्यस्य स्वाद्वम्ल कटुकात्मकः । अ. हृ. सू. 1/17

विपाकस्त्रिविधिः, सर्वद्रव्याणां परिणामकलिभावी कार्यानुमेयो जाठराग्नि-सम्बन्धाद्रसस्य स्वरूपान्तरप्रादुर्भावः । स त्रिधैव, रसषट्त्वेऽपि न षोढ़ा । तेन किञ्चित्स्वादुपाकं, किञ्चिदम्लविपाकं, किञ्चित्कटुविपाकं द्रव्यम् । तत्र मधुर-लवणयोर्मधुरो विपाकः । अम्लस्याम्लः । तिक्तकटुकषायाणां कटुकः । स च कार्यानुमेयः । अरुणदत्त भाष्य-अ. हृ. सू. 1/17

स्वादुः पटुश्च मधुरम्लोऽम्लं पच्यते रसः । तिक्तोषणकषायाणां विपाकः प्रायशः कटुः ॥

अ. हृ. सू. 9/21

Acharya Vagbhata supports *Trividha Vipaka Vada* saying that the six *Rasas* usually undergo three *Vipaka* they are *Madhura, Amla* and *Katu*.

Rasa		Vipaka
Madhura, *Lavana*	-	*Madhura*
Amla	-	*Amla*
Katu, *Tikta*, *Kashaya*	-	*Katu*

स्वादुः स्वादुविपाको, लवणोऽपि स्वादुविपाक इत्यर्थः । अम्लो रसो-दधिकाञ्जिकादिः, अम्लं पच्यते-अम्ले विपाको भवति । तिक्तोषण कषायाणां प्रायशः कटुर्विपाको भवति । प्रायशोग्रहणं पूर्वत्रापि योजनीयम् । तेन व्रीहिस्थो मधुरो रसोऽम्लं पच्यत इत्युपन्नम् । तथा चोक्तम् (अ. हृ. सू. 6/10)- ''स्वादुरम्लविपाकोऽन्यो व्रीहिः'' इति । तथा हरीतक्या भूयस्त्वेन यः कषायो रसः, स मधुरमेव पच्यते । तथा कटुको रसः शुण्ठ्याद्रेक पिप्पल्यादिस्थो मधुर पच्यते । तथा चोक्तम् (अ. हृ. सू. 6/153)- ''कषाया मधुरा पाके'' इति । तथा (अ. हृ. सू. 6/63)- ''नागरं दीपनं वृष्यं ग्राहि हृद्यं निबन्धनुत् । रुच्यं लघुस्वादुपाकं (अ. हृ. सू. 6) इति, तद्वदार्द्रकम्'' इति । तथा श्लेष्मला स्वादुशीताऽऽर्द्रा इत्यारभ्य यावत् 'स्वादुपाका' (अ. हृ. सू. 6) इति । अत्र केचिदाहुः तिक्तकषाययोरव कटुविपाकतया पित्तकर्तत्वमापद्यत इति । तदेतदसत्, शीतवीर्यत्वेनतयोः पित्तहर्तृत्वात् । वीर्यं हि रसविपाकौ विजयते । अरुणदत्त भाष्य-अ. हृ. सू. 9/21

विपाकत्रैविध्यमाह-स्वादुरिति । स्वादुः पटुश्च मधुरो लवणश्च मधुरं पच्यते पक्वो मधुरत्वं यातीत्यर्थः । मधुरमिति क्रियाविशेषणम् । पच्यत इति कर्म-कर्तर्यात्मनेपदम् । एवमम्लो रसोऽम्लं पच्यते । तिक्तादीनां त्रयाणां कटुको विपाकः । मधुरस्यापि व्रीहिर्विपाकेऽम्लत्वात् लवणस्यापि सौवर्चलस्य कटुविपाकत्वात्, कषायस्यापि कुलत्थस्याम्लविपाकत्वात् 'प्रायश' इत्युक्तम् ।

हेमाद्रि भाष्य-अ. हृ. सू. 9/21

The word *'Prayashaha'* denotes that there are exceptions to this rule. As we see a few examples where *Vipaka* doesn't follow the above general rule.

Sl. No.	*Dravya*	*Rasa*	*Vipaka*
1	*Vrihi*	*Madhura*	*Amla*
2	*Sauvarcala*	*Lavana*	*Katu*
3	*Dadima*	*Amla*	*Madhura*
4	*Patola*	*Tikta*	*Madhura*
5	*Pippali*	*Katu*	*Madhura*
6	*Kulattha*	*Kashaya*	*Amla*

Even though there are exceptions but the total number of *Vipaka* are three only.

विपाकस्तूच्यते-विपाकस्तु प्रायः स्वादुः स्वादु-लवणयोः, अम्लोऽम्लस्य, कटुरितरेषाम् ।
अ. सं. सू. 17/16

स्वाद्वम्ल-कटुकास्त्रयो विपाकाः । तत्र मधुरद्रव्यस्य सर्वस्य मधुरविपाकित्वं, तद्वल्लवणस्यः अम्लो विपाकोऽम्लस्यैवः; शेषाणां कटुः । विपाकस्तु जङ्गराग्निसंयोगे परिणामवशाद् द्रव्यस्य रसस्य स्वरूपान्तरप्रादुर्भावः । इन्दु भाष्य अं. सं. सू. 17/16

Ashtanga Sangrahakara also supports the view of *Caraka* i.e. *Trividha Vipaka Vada.* Usually *Vipaka* are three. *Swadu, Amla & Katu.*

Swadu, *Lavana*	-	*Swadu*
Amla	-	*Amla*
Katu, *Tikta*, *Kashaya*	-	*Katu*

पराशरस्तु पठति-

पाकास्त्रयो रसानामम्लोऽम्लं पच्यते, कटुः कटुकम् ।
चत्वारोऽन्ये मधुरं, संकीर्णरसास्तु संकीर्णतम् ॥
कटु-तिक्त-कषायाणां कटुको येषां विपाक इति पक्षः ।
तेषां पित्तविधाते तिक्त-कषायौ कथं भवतः ॥ अ. सं. सू. 17/17-18

In *Ashtanga Sangraha* we come across a cross reference to *Parashara's* view on *Vipaka.*

Parashara accepts *Trividha Vipaka* and says,

Rasa		**Vipaka**
Madhura, *Tikta*, *Kashaya*, *Lavana*	-	*Madhura*
Kaṭu	-	*Katu*
Amla	-	*Amla*

And combined *Rasa* produces combined *Vipaka. Parashara* says that *Tikta* and *Kashaya* undergoes *Madhura Vipaka.* He argues that if *Tikta, Kashaya Rasa* undergoes *Katu Vipaka,* then it is not able to explain its *Pittahara Karma.* So considering that *Tikta, Kashaya Rasa* undergoes *Madhura Vipaka* explains its *Pittashamaka Karma.*

पराशरनामा मुनिर्विपाकामन्यथा पठितवान् । पाकस्त्रयो रसानामित्यार्याद्वयं पराशरपठितमनुपठति।

सर्वेषां रसानां त्रयो विपाकाः-मधुरः, अम्लः कटुश्च । तत्राम्लरसोऽम्लविपाकः, कटुरसः कटुविपाकः, चत्वारोऽन्ये शेषा मधुर-लवण-तिक्त कषाया मधुरविपाकः । संकीर्णरसानां मिश्ररसानां संकीर्ण विपाकित्वम् । स तु पराशरस्त्रिक्तकषाययोमधुरविपाकित्वमिच्छति, अन्ये त्वाचार्यस्तावेव कटुविपाका विच्छन्ति तन्मतं दूषयितुकामः पराशर आह-ये आचार्याः कटु-तिक्त-कषायाणां कटुविपाकित्वतिच्छन्ति तेषां तिक्त कषाययोः पित्तहरत्वं न संभवति, मन्मते तु तयोरर्मधुरविपाकित्वात् पित्तहरत्वं संभवतीति पराशरः । तच्च न चतुरस्रमिति मन्यामहे । यतः पित्तहर्तृत्वं रसस्यैव स्वरूपम् । कटुस्तु विपाको यत्र स्वल्पोऽपि भवति न तत्र कटुः स्वकार्यं करोति ' 'यद्यद् द्रव्ये रसादीनां'' (अ. सं. सू. 17) इति न्यायात् । तथा च-तिक्त रसस्य कटुविपाकस्यापि निम्बस्य पित्तहरत्वमेव । यत्र च विपाकस्य कटोराधिक्यं तत्र यस्य पित्तकतृत्वमेव । यथा-तिक्त रसेऽपि द्रव्ये कटोर्विपाकस्याधिक्यात् बृहतीद्वयस्य पित्तकरत्वम्, एवं कषायऽपि कल्पनीयम् । एवं रसस्यैव स्वभावः पित्तहरत्वम् । यतश्च तिक्तरसे कषाय रसे च द्रव्ये नैसर्गिकेण बलेन रस-वीर्यास्थां विपाकः प्रायेणाभिभूयते, अत उच्यते-तिक्त कषायौ पित्तहरावित्यस्माभिः, अतः पराशरमतमचतुरस्रमिव । इन्दु भाष्य-अ. सं. सू. 17/17-18

Indu comments that *Tikta Rasa* is mainly responsible for *Pitta Shamaka* action. In *Dravyas* where the degree of *Katu Vipaka* is very weak, there *Vipaka* is suppressed by *Rasa* and exhibits its action. Hence, though *Nimba* (*Azadirachta indica*) which is *Tikta Rasa* undergoes *Katu Vipaka* is *Pittashamaka* Here *Tikta Rasa* exhibits its *Karma*.

In *Dravyas* where *Katu Vipaka* is strong, *Vipaka* suppresses *Rasa* and exhibits its *Karma*. So we observe that *Tikta Rasayukta Brahati Dwaya* is *Pittakaraka* where *Katu Vipaka* is dominating.

Hence in *Tikta, Kashaya Rasa Dravyas,* usually the natural or inherent power of *Rasa* and *Virya* overpowers *Vipaka*. Hence we observe that *Tikta, Kashaya Dravyas* are *Pittahara.*

वस्तुतस्तु दोषाणां त्रैविध्याद्विपाकस्यापि तदनुगुणतया त्रैविध्यमेवोचितम् । योगेन्द्रनाथ सेन भाष्य

Yogendranath Sen opines that as *Doshas* are of three types *Vipaka* is also of three types based on its action over *Dosha.*

Table showing action of *Vipaka* on *Dosha:*

Sl. No.	*Vipaka*	Action on *Vata*	Action on *Pitta*	Action on *Kapha*
1	*Madhura*	*Shamaka*	*Shamaka*	*Vardhaka*
2	*Amla*	*Shamaka*	*Vardhaka*	*Vardhaka*
3	*Katu*	*Vardhaka*	*Vardhaka*	*Shamaka*

अन्ये तु वातादिभ्यो दोषेभ्य एव त्रीन् पाकानिच्छन्ति-कफात् वातकफाच्च मधुरः, कफपित्तादम्लः, वातात् पित्तात् वातपित्ताच्च कटुक इति । तदुक्तं-कफात् वातकफात् स्वादुरम्लः

वित्तकण्ङ्गोद्भवः । दोषैस्त्रयोऽनिलात् पित्तात् वातपित्तात् कटुर्मतः । शिवदास सेन

Acharya Shivadasa Sen presents his view with little alteration. According to him particular *Dosha* is responsible for particular *Vipaka.* i.e.

Dosha	*Vipaka*
Kapha	*Madhura*
Kaphavata	*Madhura*
Kaphapitta	*Amla*
Vata	*Katu*
Pitta	*Katu*
Vatapitta	*Katu*

This concept is not accepted because it is not the *Dosha* which decides the *Vipaka, Rasa* is one which transforms into *Vipaka. Vipaka* may show its action on *Dosha* but *Dosha* does not show its action on *Vipaka.*

3. *Dwividha Vipaka Vada* (Two types of *Vipaka*)

आगमस्त्वाह-द्विविध एव पाको मधुरः, कटुकश्चः तयोर्मधुराख्यो गुरुः, कटुकाख्यो लघुरिति । तत्र पृथिव्यसेजोवाय्वाकाशानां द्वैविध्यं भवति तद् गुण साधर्म्याद, गुरुता, लघुता च; पृथिव्यापश्च गुर्व्यः, शेषाणि लघूनि; तस्माद् द्विविध एव विपाक इति ।

भवन्ति चात्र-

द्रव्येषु पच्यमानेषु येष्वम्बु पृथिवी गुणाः । निर्वर्तन्तेऽधिकास्तत्र पाको मधुर उच्यते ॥
तेजोऽनिलाकाशगुणाः पच्यमानेषु येषु तु । निर्वर्तन्तेऽधिकास्तत्र पाकः कटुक उच्यते ॥

सु. सू. 40/10-12

Sushruta has proposed *Dwividha Vipaka* concept. Acc. to him *Vipaka* is of two types - *Madhura* and *Katu. Madhura Vipaka* can be considered as *Guru Vipaka* and *Katu Vipaka* is considered as *Laghu Vipaka.*

Guru Vipaka has dominance of *Prithvi* and *Ap Mahabhuta,* whereas *Laghu Vipaka* has predominance of remaining *Mahabhūtas* like *Agni, Vayu* and *Akasha.*

Further *Sushruta* describes that *Madhura Vipaka* exhibits certain qualities which have dominance of *Prithvi* and *Ap Mahabhuta.* On the other hand *Katu Vipaka* exhibits qualities of *Agni, Vayu* and *Akasha Mahabhūtas.*

This *Dwividha Vipaka Vada* is considered as concise form of *Panchavidha Vipaka Vada.*

Sl. No.	*Vipaka*	*Panchabhuta* Relation	*Rasa*	Equated with
1	*Madhura*	*Prithvi* & *Ap*	*Madhura, Amla* & *Lavana*	*Guru*
2	*Katu*	*Agni, Vayu* & *Akasha*	*Katu, Tikta* & *Kashaya*	*Laghu*

आगमादिति यदुक्तं तद् व्याकरोति-आगमस्त्विहेत्यादि । आगम इह धन्वन्तरिवचनं; तमनुवदति-द्विविध एव पाको मधुरः कटुकश्च इति । मधुरकटुकपाक्योर्यथाक्रमं गुरुतां लघुतां च चिकित्सोपयुक्तां दर्शयति-तयोर्मधुराख्या इत्यादि । मधुरे गौरस्य कटौ च पाके लाघवस्योपपत्तिं दर्शयन् भूतगुणादिति हेतुं च व्याकरोति-तत्र पृथिवीत्यादि । पञ्चानां भूतानां कथं द्वैविध्यमित्याह-तद्गुण-साधर्म्यादिति ।
चक्रपाणि भाष्य-सु. सू. 406/10-12

स्वमतमिदानीं दर्शयन्नाह-आगमे इत्यादि । आगमे शास्त्रे । अन्ये 'आगमस्त्विह' इति पठन्ति । तत्र तु शब्दोऽव्यर्थः, अथवा विशेषार्थस्तुशब्दः, तेन प्रत्यक्षादि-प्रमाणाविरुद्धोऽपि शिष्टागम इत्यर्थः; अथवा, आगमशब्दोऽयं सिद्धान्त वचनः, तेन सिद्धान्तः पुनरिहेत्यर्थः । पृथिव्यप्तेज इत्यादि । पृथिव्यादीनां गुणसाधर्म्याद् गुणसमानतया द्वैविध्यं भवतीत्यर्थः । गुणमेवाह-गुरुता लघुता चेति । भवन्ति चात्रेत्यादि । निर्वर्तन्ते तेऽधिका इति जायन्ते उत्कटा इत्यर्थः । डल्हण भाष्य-सु. सू. 40/10-12

Both *Cakrapani* and *Dalhana* have supported the view of *Sushruta* and given similar explanations.

मधुरोऽपि पार्थिवाप्यः, गुरुरपि गुणः पार्थिवाप्य इति, तथा गुणशब्दोऽपि परिणामे गुरुर्लघुरिति; गौणगुरुगुण जनितः परिणामे गुरुरित्युक्तः, लघुगुणजनितो लघुरिति । मधुरो गुरुभ्यां, कटुर्लघुभिः (सु. 54), गुणकारणत्वं कथं भवतीत्याह-मधुर इत्यादि । मधुरो विपाको गुरुभ्यां पृथिव्युदकाभ्यां भवति, कटुर्लघुभिरिति त्रिभिरग्न्यादिभिर्भवति । एवं भूतैराधिक्यान्निर्वर्त्यमान्ये पाके तद्गुणसमावेशाच्चिरादचिराच्चेति विशेषो भवतीति । आह च-''द्रव्यस्य पच्यमानस्य यस्यापां धातुरुत्तमः । निर्वर्तते पार्थिवश्च तस्य पाको ध्रुवं गुरुः । आपो निर्वर्त्यमाना हि मृदुं कुर्वन्ति पावकम् । पृथिवी धातुरप्येवं तस्मात् पाकस्तयोर्गुरुः । एतत्तु गुरुपाकानां द्रव्याणां पाकलक्षणम् । अत ऊर्ध्व प्रवक्ष्यामि लघुपाकं यथा भवेत् । हीनश्च पृथिवीधातुर्विविक्तपश्चाद् गुणाः स्मृताः । यस्मिन् द्रव्ये भवन्त्येवं तस्य पाको ध्रुवं लघुः इति । भाष्य-र. वै. अ. 2/54

Badanta Nagarjuna also supported *Dwividha Vipaka* theory. Even he has given *Guru* term for *Madhura Vipaka* and *Laghu* for *Katu Vipaka. Badanta Nagarjuna* gives another two terms i.e. *Chira* and *Achira* considering the fact that how much times it takes to undergo *Paka.*

He gives reason for *Guru* and *Laghu Vipaka,* that *Guru* has predominance of *Prithvi* and *Ap Mahabhūta,* which subside *Agni,* hence undergo *Paka* lately (*Chirapaka*), whereas *Laghu Vipaka* which has dominance of *Agni, Vayu* and *Akasha Mahabhuta* improves *Agni* and hence undergo *Paka* quickly (*Achira Paka*).

Sl. No.	Paka	Sushruta/ Dalhana	Badanta Nagarjuna	Mahabhuta Pradhanyata
1	*Madhura*	*Guru*	*Chirapaki*	*Prithvi & Ap*
2	*Katu*	*Laghu*	*Achirapaka*	*Agni, Vayu &Akasha*

Trividha Vipaka Verses *Dwividha Vipaka* (Similarity and Differences between *Trividha* & *Dwividha Vipaka*)

केचित् त्रिविधमिच्छन्ति-मधुरं, अम्लं, कटुकं चेति । तत्तु न सम्यक्, भूतगुणादागमाच्चाम्लो विपाको नास्ति; पित्तं हि विदग्धमम्लतामुपैत्याग्नेयत्वात्:, यद्येवं लवणोऽप्यन्यः पाको भविष्यति, श्लेष्मा हि विदग्धो लवणतामुपैतीति । सु. सू. 40/10

Sushruta while explaining *Dwividha Vipaka* mentions that some scholars have mentioned three types of *Vipaka* namely *Madhura, Amla* and *Katu* and he condemn, that theory in establishing *Dwividha Vipaka Vada.*

Acc to him *Amla* is the state which is seen only in *Vidagdhavastha* of *Pitta* not during its *Prakrautavastha.* In *Prakrutavasta* of *Pitta, Katu* will be the taste hence this *Amla Vipaka* cannot be accepted. In *Vipaka,* only *Prakrutavasta* is to be considered not *Vikrutavastha* of any *Dosha.* If *Vikrutavastha* is considered then *Lavana Vipaka* should also be accepted which is the state seen in *Vidagdhavastha* of *Kapha.*

अम्लपाकस्याभ्युपगमानभ्युपगमयोर्बीजे तु चरकनये पित्तं प्रकृत्याम्लं कटु च; सुश्रुते तु कटुरसं, यत् पुनरम्लत्वं तदस्य विदग्धस्यैवेति सुश्रुतेन पित्तस्य प्राकृतस्याम्लत्वानङ्गीकारात् सुतरामम्लपाकोऽपि नाङ्गीक्रियते, निष्प्रयोजनत्वात् इह पुनरम्लः पाकः सप्रयोजन एव । योगेन्द्रनाथ भाष्य

Yogendranath Sen opines that the reason for the difference between *Charaka* and *Sushruta* is *Charaka* has considered both *Amla* and *Katu Rasas* for *Prakrutavastha* of *Pitta* whereas *Sushruta* consider *Katu Rasa* for *Prakruta Avastha of Pitta* and not *Amla,* which is seen in vitiated condition of *Pitta.*

कालतो गुणतो रसतश्चानुपपत्तिः त्रित्वस्य । र. वै. सू. 4/50

एवं परस्य हेतुदूषणं कृत्वा विपाकद्वित्वसाधकानां हेतूनां त्रित्वसाधकत्वेऽभावं दर्शयन्नाह-कालत इत्यादि । कालतस्त्रित्वं नोपपद्यते, चिराचिरकालव्यतिरिक्त स्याभावात्; पूर्वं 'कतमे षट् काला' इत्यत्र कृतभाष्यम् । गुणतश्च त्रित्वं नोपपद्यते; गुरुभूतजनिता, लघुभूतजनिता, इति गुणद्वैविध्याति । रसतश्च त्रित्वस्यानुपपत्ति; कटुक-तिक्त-कषायास्तु लघवो, गुरवः परे, इति द्विविधभेदावरोधादिति । रसत इत्यस्यादमर्थी न भवति, गुणत इत्यत्रैवावरोधात् । तस्मादन्यथा वर्ण्यन्ते यथाऽस्माकं मधुर कटुकशब्दौ रसवाचकौ मुख्यौ गुणवृत्या विपाकेऽध्यारोपितौ, तथाऽम्लशब्दस्य विपाकेऽर्थान्तरेध्यारोपपितुं न शक्यते गौरवाभावादिति; हेत्वभावो ' 'मधुरो गौरवाल्लधुत्वात् कटुक इत्यस्य वाक्यस्य भाष्ये प्रदर्श्यते । भाष्य

Badanta Nagarjuna also proposed the theory of *Dwividha Vipaka.* He gives following reasons to say *Vipaka* are of two kinds.

1. *Kalataha*

There are only two kinds of substance as per time taken for undergoing *Vipaka. Chira* and *Acira, Chira* is one which takes more time to undergo *Vipaka* hence it is also known as *Guru Vipaka.* Whereas *Achira* is one which undergo *Vipaka* very quickly and it is known as *Laghu Vipaka.* Apart from these two there is no possibility of a third one, hence *Vipaka* are of two types, not three.

2. *Gunataha*

If *Guna* is considered then also *Vipaka* is of two types viz. *Gurubhuta Janita* and *Laghubhuta janita* hence *Vipaka* is of two types.

3. *Rasataha*

If *Rasa* is taken, transformation of *Rasas* will happen in two categories.

(i) *Madhura-Amla* & *Lavana* undergoes *Guru Vipaka.*

(ii) *Katu-Tikta* & *Kashaya Rasas* undergo *Laghu Vipaka.* Here *Rasas* are assessed through their *Guna* only.

If observed carefully both *Acharya's* views are acceptable. The base for ideologies of both *Acharyas* are different.

Charaka has considered *Prakrata Avastha* of *Tridoshas* giving importance to the state of *Rasa.* Whereas *Sushruta* explained on the basis of *Panca Mahabhuta* and their qualities. Here *Doshas* are having respective *Mahabhuta Pradhanyata* and they are identified or assessed through their qualities.

Both *Acharya's* have accepted *Madhura* and *Katu Vipaka.* The difference is there only in considering *Amla Vipaka.* Here *Sushruta* has not described the *Vipaka* of *Amla Rasa.*

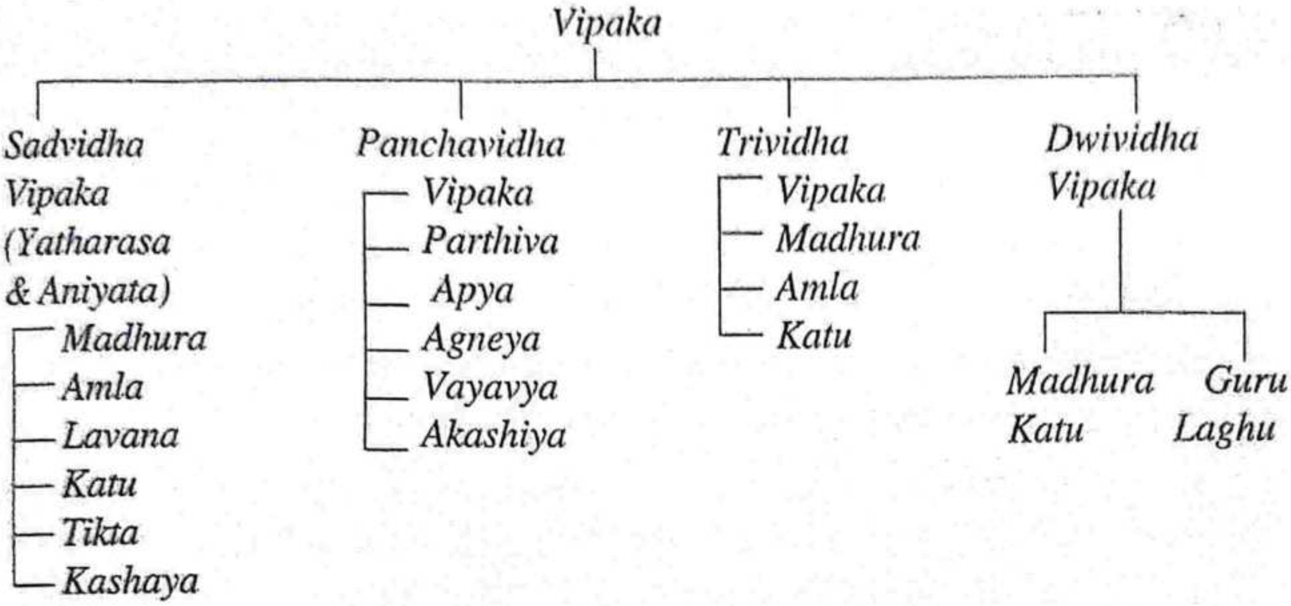
In mentioning predominent *Mahabhutas* of six *Rasas* also there is difference between *Sushruta* and *Caraka. Caraka* said *Prithvi* & *Agni Mahabhuta Pradhanyata* for *Amla Rasa* where as *Sushruta* mentioned *Ap* and *Agni.*

Understanding of *Vipaka* is based on *Avastha* of *Dosha,* while explaining *Vipaka Prakruta Avastha* of *Dosha* in relation with *Rasa* is considered. *Sushruta* has not accepted *Amla Rasa* as *Prakruta Avastha Rasa* of *Pitta,* he considers *Katu* in place of *Amla.*

Inclusion of *Amla Rasa* under *Guru Vipaka* is also questionable, as it is the combination of *Ap* & *Agni,* represents *Guru* and *Laghu* respectively. Finally it becomes incon-

clusive, but usually we come across *Trividha Vipakas* namely *Madhura, Amla* and *Katu*, while studying about *Dravyas*.

Schematic Representation of Different Types of *Vipaka*



4. *Vipaka Guna Karma* (Properties and actions of *Vipaka*)

The effect of *Vipaka* on the body is elaborately explained by *Charaka*. He clearly explains the effect of each *Vipaka* on *Dosha, Dhatu & Mala*.

मधुरो लवणाम्लौ च स्निग्धभावात्रयो रसः । वातमूत्रपुरीषाणां प्रायो मोक्षे सुखा मताः ॥
कटुतिक्तकषायास्तु रूक्षभावात्रयो रसाः । दुःखाय मोक्षे दृश्यन्ते वातविण्मूत्र रेतसाम् ॥
शुक्रहा बद्धविण्मूत्रो विपाको वातलः कटुः । मधुरः सृष्ट विण्मूत्रो विपाकः कफशुक्रलः ॥
पित्तकृत् सृष्टविण्मूत्रः पाकोऽम्लः शुक्रनाशनः । तेषां गुरुः स्यान्मधुरः कटुकाम्लावतोऽन्यथा ॥
च. सू. 26/59-62

Sl. No.	*Vipaka*	*Guna*	Effect on *Dosha*	Effect on *Dhatu*	Effect on *Mala*
1	*Madhura*	*Snigdha, Guru*	*Kapha vardhaka*	*Shukrala*	*Srashta Vinmutra*
2	*Amla*	*Snigdha, Laghu*	*Pitta vardhaka*	*Shukranashana*	*Srashta Vinmutra*
3	*Katu*	*Ruksha*	*Vata vardhaka*	*Shukranashana*	*Baddha Vinmutra*

In this context, *Charaka* says that *Madhura Vipaka* is *Guru* in nature while *Katu, Amla* are *Laghu*. This correlates with *Sushruta's Dwividha Vipaka Vada*.

Acharya Sushruta also quotes the properties of *Guru & Laghu Vipaka.*

गुरुपाको वातपित्तघ्नः लघुपाकः श्लेष्मघ्नः । ......गुरुपाकः सृष्टविण्मूत्रतया कफोत्क्लेशन च, लघुर्बद्धविण्मूत्रतया मारुत कोपेन च । सु. सू. 41/11

Sl. No.	*Vipaka*	Effect on *Dosha*	Effect on *Mala*
1	*Guru*	*Vatapittahara, Kaphotkleshana*	*Srashta Vinmutra*
2	*Laghu*	*Sleshmahara, Vatakopana*	*Badda Vinmutra*

Vagbhata considers that the effects of *Vipaka* are similar to its *Rasa.*

रसैरसौ तुल्यफलः ।अ. स. सू. 17/16

असौ विपाको रसैर्मधुराम्लकटुकैस्तुल्यफलः सदृशफलः । तेन मधुरस्य विपाकस्य ते गुणा ये मधुरस्य रसस्य । एवमम्लकटुकयोरपि । इन्दु भाष्य-अ. सं. सू. 17/16

Hence properties and actions of *Madhura Vipaka* are similar to the properties and actions of *Madhura Rasa.* The same principle applies to *Amla & Katu Vipaka* also.

वर्धनक्षपणप्रशमप्रकोपेषु तयोरनियमः । र. वै. अ. 1-सू. 53

यथा लघुविपाकमुदम् । श्लेष्मणा वर्धयति, लघुविपाकं मधु श्लेष्माणां हरतीति । तस्मादमेव गुरुविपाको वर्धन एव लघुविपाकः शमन एव इति नियमो नास्ति । भाष्य-र. वै. 1/53

Nagarjuna opines that the properties & actions of *Vipaka* cannot be generalised as we observe that *Jala* which undergoes *Laghu Vipaka* is *Kapha Vardhaka* and *Madhu* which also undergoes *Laghu Vipaka* is *Kapha Shamaka.*

Hence the properties & actions of *Vipaka* do not follow a systematic rule.

Sl. No.	*Dravya*	*Vipaka*	Effect on *Dosha*
1	*Jala*	*Laghu*	*Kaphavardhaka*
2	*Madhu*	*Laghu*	*Kaphashamaka*

5. *Vipaka Taratamya* (Grading of *Vipaka*)

विपाकलक्षणस्याल्पमध्यभूयिष्ठतां प्रति । द्रव्याणां गुणवैशेष्यात्तत्र तत्रोपलक्षयेत् ॥

च. सू. 26/63

विपाक लक्षणस्याल्पमध्यभूयिष्ठतामुपलक्षयेत्, प्रति प्रति द्रव्याणां गुणवैशेष्या-द्धेतोरित्यर्थः । एतेन, द्रव्येषु यद्गुण वैशेष्यं मधुरत्व मधुरतरत्वमधुरतमत्वादि, ततो हेतोर्विपाकानामल्पत्वादयो विशेषा भवन्तीत्युक्तं भवति । चक्रपाणि भाष्य-च. सू. 26/63

तेन मधुर रसविपाको मधुरः श्रेष्ठो विण्मूत्रमोक्षे कफशुक्रवृद्धौ च, लवणरसविपाको मधुरस्वल्प

सृष्टविण्मूत्र कफशुक्रश्चाल्पः अम्लश्च मध्यमसृष्ट-विण्मूत्रः शुक्रनाशनश्च मध्यमः, तिक्तकटु-कषायाणां तिक्तरस विपाकः कटुरल्परूपेण शुक्रहा वृद्धविण्मूत्रो वातलश्च कटुरसविपाकः कटुर्मध्यमरूपेण, कषाय रसविपाकः कटुकत्तमरूपेणेति । एवं द्रव्याणां स्नेहरौक्ष्यादि गुणवैशेष्यादल्पमध्यश्रेष्ठतामुपलक्ष्य ब्रुयात् । गङ्गाधर-च. सू. 26

The degree of variation of *Vipaka* depends on the variation of *Rasa* & *Guna* in the *Dravya*. *Charaka* expresses this as three degrees: *Alpa, Madhya* & *Uttama.*

Vipaka	*Uttama*	*Madhyama*	*Alpa*
Madhura	*Madhura*	*Amla*	*Lavana*
Katu	*Kashaya*	*Katu*	*Tikta*

These shows that a *Madhura Rasa Dravya* undergoing *Madhura Vipaka* will exhibit maximum effect on the body when compared to *Madhura Vipaka* from *Lavana Rasa* will have least effect with respect to *Srashta Vinmutra, Kapha* & *Shukra Vraddhi.*

रसै रसौ तुल्यफलः । द्रव्यगुणविशेषेण चास्याल्पमध्यभूयस्त्वमुपलक्षयेत् । अ. सं. सू. 17/16

अस्य च विपाकस्य स्वल्पत्वं मध्यस्त्वं भूयस्त्वं च द्रव्यगुण विशेषेणोपलक्षयेत् । किमुक्तं भवति? उच्यते-यत्र रसेन सदृशो विपाको मधुराम्लकटुकानां द्रव्याणां तत्र प्रधानरससमानगुणा-नामुत्कृष्ठत्वाद्विपाकस्योत्कृष्टत्वं कल्पनीयम् । एवं मध्यत्वान्मध्यत्वम् । स्वल्पत्वाच्च स्वल्पत्वम् । यत्र तु रसाद्विपरीतो विपाको लवणतिक्त-कषायाणां तत्र रसविपरीतानां गुणानामुत्कृष्टत्वादुत्कृष्टत्वं कल्पयेद्विपाक सदृशाना-मित्यर्थः । एवं मध्यत्वमल्पत्वं च । इन्दु भाष्य-अ. सं. सू. 17/16

Ashtanga Sangrahakara mentions about *Taratama* of *Vipaka* as *Alpa, Madhya* and *Bhuyastwa.*

Indu in his commentary elaborately explains that if *Madhura, Amla* & *Katu* are the *Pradhana Rasa* of that *Dravya* and if undergoes respective *Vipaka* then it is superior, whereas these *Rasas* if they possess *Madhyama Bala* will be of *Madhyama Vipaka* and if *Alpa Bala* then will be of *Swalpa* type.

Then in case of *Dravyas* having *Lavana, Tikta* and *Kashaya Rasas,* if the *Dravyas* possess good qualities then it will be *Utkrashta Vipaka,* if moderate qualities then *Madhya Vipaka* and if lesser qualities then it is considered as *Swalpa Vipaka.*

Madhura Rasa *Amla rasa* *Katu Rasa*	*Samana Guna* with respect to Rasa	→	Respective → *Utkrashta Vipaka*
Madhura Rasa *Amla rasa* *Katu Rasa*	*Madhyama Guna*	→	Madhya Vipaka

Madhura Rasa *Amla rasa* *Katu Rasa*	*Swalpa Guna*	→	*Swalpa Vipaka*
Lavana Rasa *Tikta rasa* *Kashaya Rasa*	*Utkrishta Guna*	→	*Utkrishta Vipaka*
Lavana Rasa *Tikta rasa* *Kashaya Rasa*	*Madhyama Guna*	→	*Madhya Vipaka*
Lavana Rasa *Tikta rasa* *Kashaya Rasa*	*Swalpa Guna*	→	*Alpa Vipaka*

6. *Vipaka Upalabdhi Hetu* (Assessment of *Vipaka*)

विपाकः कर्मनिष्ठया । च. सू. 26/66

कर्मणो निष्ठा निष्पत्ति-कर्मनिष्ठा कर्मसमाप्तिः । रसोपयोगे सति योऽन्त्याहार परिणामकृतः कर्मविशेषः कफ-शुक्राभिवृद्ध्यादिलक्षणः, तेन विपाको निश्चीयते, एतेन विपाको नित्यपरोक्षः, तत्कार्येणानुमीयते । चक्रपाणि भाष्य-च. सू. 26/66

Charaka opines that *Vipaka* is determined by its actions on the body.

Chakrapani comments that *Vipaka* is always assessed through *Anumana* i.e. it is inferred through its effect on the body.

तर्हि विपाकोऽपि वीर्यं निपाते द्रव्याणां नोपलभ्यते, कथमुपलभ्यत इत्याह-विपाकः कर्मनिष्ठयेति, द्रव्याणां भुक्तानां यावन्ति कर्माणि तावतां कर्मणां निष्ठया परिसमाप्तया विपाक उपलभ्यते ।

गंङ्गाधर भाष्य-च. सू. 26/66

Gangadhara also expressed same opinion that once ingested substance undergoes digestion and exhibits particular action then only *Vipaka* may be known.

विपाकः कर्मणः आहारपरिणामकृतस्य, निष्ठा निष्पत्तिः दोष-शुक्रवृद्धि-क्षयलक्षणा, तया उपलभ्यते । योगेन्द्रनाथ सेन

Yogendranath Sen is also of the same view and says that *Vipaka* can be determined by its therapeutic actions observed after digestion. The effect of *Dravya* on *Dosha, Dhatu* in the form of *Kshaya* and *Vraddhi* infers its *Vipaka.*

अयं च विपाकाधेयो रसो न रसनेन्द्रिय ग्राह्यः, किन्तु तत्तत्कार्येणैवोन्नीयते-यथा कटुरसाया उष्णवीर्याया अपि शुण्ठ्या वृष्यत्वेन मधुरः पाकोऽनुमीयते, तथा लवणस्य सृष्टविण्मूत्रत्वेन मधुरः पाक उन्नीयते, तथा तिक्तकषाययोर्बद्धविण्मूत्रतया कटुपाक उन्नीयते । शिवदास सेन

Shivadasa Sena further explains this view with suitable examples. Though *Vipaka* follows *Rasa* it cannot be assessed by *Rasanendriya*, but by their actions.

Shunthi which has *Katu Rasa, Ushna Virya* exhibits *Vrashya* action. This *Vrashya Karma* infers that *Shunthi* undergoes *Madhura Vipaka.* Similarly the *Srashta Vinmutra* action of *Saindhava Lavana* determines that it undergoes *Madhura Vipaka.*

विपाकं द्रव्याणां कर्मणः परिनिष्ठया । अ. सं. सू. 17

विपाक विशेषं तु कर्मणः तत्कृतस्य परिनिष्ठया निष्पत्तेः दोषवृद्धि क्षय विशेषेण विद्यात् ।

इन्दु भाष्य-अ. सं. सू. 17

Vagbhata says that perception of *Vipaka* is through the *Vriddhi-Kshaya* of *Dosha's* in the body.

7. *Rasa Vipaka yorbheda* (Differences between *Rasa* & *Vipaka*)

न, भिन्नलक्षणत्वात् । र. वै. सू. अ. 4/32

नायं पक्ष साधुः । कुतः ? भिन्नलक्षणत्वात्; 'आस्वाद ग्राह्यो रसः', परिणाम लक्षणो विपाकः इति । विपाकस्य मधुरता कथमास्वाद्यते ? यद्यास्वाद्येत्, रसलक्षणत्वाद् रस एवेति । विपाकाभावः; यदि नास्वाद्येत्, कथं भवता 'मधुरं पच्यते' इत्युपलब्धिमित्युक्तं भवति । भाष्य

Vipaka and *Rasa* are different entity of a *Dravya,* which may be known through the following examples.

Sl. No.	Particulars	*Rasa*	*Vipaka*
1	*Lakshana*	रसनेन्द्रिय ग्राह्यो रसः । (आस्वाद) Rasa is perceived through *Rasanendrya*	परिणाम लक्षणो विपाकः Final transformation after digestion is *Vipaka*
2	*Upalabdhi*	*Rasa Āswadana* will happen immediately	*Vipaka Upalabdhi* takes place after sometime

Acharya P.V. Sharmaji put forth the following points to bring out the differentiation between *Rasa* & *Vipaka.*

Sl. No.	*Bheda*	*Rasa*	*Vipaka*
1	*Lakshana*	रसनेन्द्रिय ग्राह्यो रसः । *Rasa* is perceived through *Rasanendriya*	परिणाम लक्षणो विपाकः Final transformation after digestion is *Vipaka*
2	*Kala*	Quick action	Delayed action
3	*Karma*	Has both local and systemic effects	Has only systemic effects

4	*Karmadhi-shthana*	Has effect on mind & body	Has only physical effects
5	*Upalabdhi*	रसो निपाते द्रव्याणाम् । *Rasa* assessed by *Indriya* and is *Pratyakshagamya*	विपाकः कर्मनिष्ठया । *Vipaka* assessed by actions & is *Anumana Gamya*

8. Clinical Application and Research updates

Clinical Application

Vipaka is important in selection of particular drug as per the disease. *Vipaka* is also playing major role in bringing specific *Karma* (Pharmacological action) from the *Dravya*. For example; *Vrashya* (Aphrodisiac) *Karma* is attributed to *Madhura Vipaka* of *Pippali* (*Piper longum*).

Vipaka is responsible for *Dosha Shamana* (pacifying) and *Dosha Vardhana* (aggravation), if the *Dravya* undergoes *Samyak Paka* (proper metabolism) then there will be *Dosha Prashamana* and on the other hand if there is *Asamyak Paka* (improper metabolism) it aggravates *Dosha*, hence it is very much important to know about *Vipaka*.

If there is no Vipaka then there won't be any treatment possible as the Dravya's shows their actions after undergoing digestion.

Research Methods:

Assessment of *Vipaka*

a. Aim : To determine the *Vipaka* of *Choorna* (Powder) of given drug sample through *Pratyaksha* (observation) and *Anumana* (inference).

b. Principle : *Vipaka* of a *Dravya* can be inferred by following the determination pattern described by Acharya Charaka and Acharya Sushruta. According to Acharya Charaka, as a general rule *Dravya* having *Madhura Rasa* and *Shita Virya* will be *Madhura* in *Vipaka. Dravya* having *Amla Rasa* and *Ushna Virya* will be *Amla* in *Vipaka and Dravya* having *Katu Rasa* and *Ushna Virya* will be *Katu* in *Vipaka*. Acharya Sushruta postulated *Vipaka* on the basis of *Guna*. Accordingly, *Guru Guna* predominant *Dravyas* will be *Madhura* in *Vipaka* and *Laghu Guna* predominant *Dravya* will be *Katu* in *Vipaka*.

c. Procedure : Based on the laboratory procedures data obtained from the assessment of the *Rasa, Guna* and *Virya* were used for the inference of the V*ipaka* of *Choorna* prepared from the drug.

Inference: Based on the findings the Vipaka is inferred.

Exercises: Multiple Choice questions (MCQ)

1. Final outcome of Rasa transformation under the influence of Jatharagni is called

   a. Rasa b. Vipaka c. Virya d. Prabhava

   Ans: b. Vipaka

2. Number of Vipaka as per Charaka and Vagbhata

   a. 2 b. 4 c. 3 d. 5

   Ans: c. 3

3. Number of Vipaka according to Sushruta

   a. 3 b. 5 c. 2 d. 6

   Ans: c. 2

4. Not the type of Vipaka as per Charaka

   a. Madhura b. Katu c. Amla d. Lavana

   Ans: d. Lavana

5. Madhura and Lavana Rasa undergoes

   a. Katu b. Lavana c. Madhura d. Amla

   Ans: c. Madhura

6. Amla Rasa undergoes

   a. Madhura b. Lavana c. Katu d. Amla

   Ans: d. Amla

7. Katu Tikta Kashaya undergoes

   a. Lavana b. Katu c. Madhura d. Amla

   Ans: b. Katu

8. Madhura Vipaka is

   a. Kapha Pitta Vardhaka b. Vata Pitta Shamaka

   c. Kapha Shamaka d. Vata Vardhaka

   Ans: b. Vata Pitta Shamaka

9. Amla Vipaka is

   a. Vata Vardhaka b. Kapha Shamaka

   c. Pitta Kapha Vardhaka d. Pitta Shamaka

   Ans: c. Pitta Kapha Vardhaka

10. Katu Vipaka is

    a. Kapha Vardhaka b. Pitta Shamaka

    c. Vata Shamaka d. Vata Vardhaka

    Ans: d. Vata Vardhaka

11. Madhura Vipaka has predominance of

a. Agni b. Vayu c. Prithvi & Ap d. Akasha

Ans: c. Prithvi & Ap

12. Katu Vipaka has predominance of

a. Prithvi b. Ap

b. c. Prithvi & Ap d. Agni, Vayu & Akasha

Ans: d. Agni, Vayu & Akasha

13. As per Sushruta, Madhura Amla Lavana Rasa will have —— Vipaka

a. Katu b. Madhura c. Kashaya d. Tiktaa

Ans: b. Madhura

14. As per Sushruta Katu Tikta Kashaya Rasa Dravyas undergo ——— Vipaka

a. Madhura b. Amla c. Lavana d. Katu

Ans: d. Katu

15. Madhura Vipaka will have —— Guna

a. Snigdha & Guru b. Ruksha c. Laghu d. Ushna

Ans: a. Snigdha & Guru

16. Katu Vipaka will have

a. Snigdha b. Guru c. Snigdha & Guru d. Ruksha

Ans: d. Ruksha

17. Madhura Vipaka is

a. Shukranashaka b. Shukrala

c. Baddha Vinmutra Karaka d. Vata Vardhaka

Ans: b. Shukrala

18. Karma Nishthaya refers to Upalabdhi of

a. Rasa b. Virya c. Vipaka d. Prabhava

Ans: c. Vipaka

19. jmew jmeew leguŸeHegue: in the context of Vipaka is explained in

a. Charaka b. Sushruta c. Nagarjuna d. Vagbhata

Ans: d. Vagbhata

20. Guru Vipaka is

a. Vata Pitta hara b. Kapha hara

c. Vata Vardhaka d. Pitta Vardhaka

Ans: a. Vata Pitta hara

*****

6 Chapter

Virya Vijnana

Contents

1. *Virya Lakshana (Characteristics of Virya)*
2. Reasons in support of considering *Gunas* as the *Virya.*
3. *Virya* Vs Active constituents
4. *Guna Virya Vada* or *Paribhashika Virya Vada* (*Dwividha & Ashta Vidha Virya*)
5. *Virya Karmani (Actions of Virya)*
6. *Virya Upalabdhi Hetavaha (Assessment of Virya)*
7. Clinical application and Research Updates

1. *Virya Lakshana* (Characteristics of *Virya*)

येन कुर्वन्ति तद्वीर्यम् । च. सू. अ. 26/13; सु. सू. 41/5

येनेति प्रभावेण, रसेन, वीर्येण, विपाकेन वा; अयं वीर्य शब्दः पारिभाषिक वीर्यवचनो न भवति, किन्तु शक्तिमात्र वचनः; तेन प्रभाव रसादयः सर्व एव स्वकार्य कुर्वन्तिः शक्तिपर्याय रूपवीर्यवाच्या इति ज्ञेयाः । चक्रपाणि भाष्य-च. सू. 26/13

The factor responsible for any action is *Virya.*

Chakrapani adds, *Virya* is a *Shakti* (force/energy) of a *Dravya,* through which the *Dravya* perform any action. Even though *Prabhava, Rasa* etc. which are residing in the *Dravya* bring out their own action, but it is the *Virya* which decides the *Karma* in many instances.

......वीर्यं तु क्रियते येन या क्रिया । नावीर्यं कुरुते किञ्चित् सर्वा वीर्यकृता क्रिया ॥

च. सू. 26/65

वीर्यं त्वित्यादि । वीर्यमिति शक्तिः । येनेति रसेन वा, विपाकेन वा, प्रभावेण वा, गुर्वादि परादिभि गुणैर्वा, या क्रिया तर्पण-प्रह्लाद-शमनादि रूपा क्रियते, तस्यां क्रियायां तद्रसादिवीर्यम् । ......नावीर्यमित्यादि, अवीर्यम्, अशक्त-मित्यर्थः । वीर्यकृतेति वीर्यवता वृता वीर्यकृता ।

चक्रपाणि भाष्य-च. सू. 26/65

Virya (Potency) in general has wider meaning that there cannot be any action without the involvement of *Virya.* Thus all the actions are done by *Virya* only.

Cakrapani comments on this concept and opines that if the *Rasa* is bringing out any action of its own, then in that context *Rasa* becomes the *Virya* of that *Dravya.* So *Vipaka,*

Guna and *Prabhava* also become the *Virya* (Potency) of the *Dravya* at different circumstances.

वीर्यं शक्तिः सा च पृथिव्यादीनां भूतानां यः सारभागस्तदतिशयरूपा बोध्या । सा च द्विविधा चिन्त्याचिन्त्य क्रिया हेतुत्वेन, तत्र चिन्त्यक्रियाहेतुर्या द्रव्यरसादीनां स्वस्वकर्मणि स्वभाव सिद्धाः शक्तिः, अचिन्त्यक्रियाहेतुश्च प्रभावपर्याय द्रव्याणां रसाधननुरूपकार्यकरणशक्तिः । उक्तं च भूतप्रसादातिशयो द्रव्ये पाके रसे स्थितः । चिन्त्याचिन्त्याक्रेषा हेतुवीर्यं धन्वन्तरे मतम् ।

शिवदास सेन-द्र. गु. स. 1/8

Shivadasa Sen is also of the same opinion that *Virya* is a potency of a *Dravya* which enables the *Dravya* to show its action. More over *Virya* is *Sarabhaga* (Essence) of *Prthvi Adi Bhutas.* If it is possible to explain the factor responsible for action then it is called *Chintya Shakti* and if impossible to explain then it is called as *Achintya Shakti.*

वीर्यं द्रव्यस्य तज्ज्ञेयं यद्योगात् क्रियते क्रिया । नावीर्यं कुरुते किंचित् सर्वा वीर्यकृता हि सा ॥

अ. सं. सू. 17/12

वीर्यं तत् क्रियते येन या क्रिया । नावीर्यं कुरुते किंचित् सर्वा वीर्यकृता हि सा ॥

अ. हृ. सू. 9/13-14

Both *Vagbhatas* have similar opinion like that of *Charaka* and says all the actions done by the *Virya.*

Note: *Y. T. Acharya* has considered *Virya* as active principles of a *Dravya.*

Usually the *Gunas* which are potent are considered as *Virya.*

2. Reasons in support of considering *Gunas* as the *Virya*

गुर्वाद्या वीर्यमुच्यन्ते शक्तिमन्तोऽन्यथा गुणाः । परसामर्थ्यहीनत्वाद् गुणा रावेतरे गुणाः ॥

अ. सं. सू. 17

...गुर्वाद्या अष्टौ यदोत्कृष्टशक्तयः सन्तो द्रव्यं समधिशेरते तदा वीर्यशब्दवाच्याः, यदातुत्कृष्टशक्तियुक्ता न भवन्ति तदा सामान्यगुणा एव । ये च गुर्वादिशिष्टा द्वादश गुणाः ते स्वभावेनैव परसामर्थ्यहीना उत्कृष्टशक्तिरहितास्तेऽपि सामान्य गुणशब्द-वाच्याः, ते न कदाचिदपि वीर्याख्यां लभन्ते । इन्दु भाष्य-अ. सं. सू. 17

The eight qualities like *Guru, Laghu, Snigdha, Ruksha, Tikshna, Manda, Shita* and *Ushna* are possessing intense potency among *Gurvadi* 20 *Gunas,* they are considered as *Virya* whereas remaining 12 qualities won't have strong potency hence they are only qualities.

गुर्वादिष्येव वीर्याख्या तेनान्वर्थेति वर्ण्यते । समग्रगुणसारेषु शक्त्युत्कर्षविवर्तिषु ॥
व्यवहाराय मुख्यत्वात् बह्वग्रग्रहणादपि । अतश्च विपरीतत्वात् संभवत्यपि नैव सा ॥

अ. हृ. सू. 9/14-16

Ashtanga Hradayakara gives four reasons to state why only eight among 20 *Gurvadi Gunas* to be considered as *Virya.*

1. *Samagraguna Sarata*

समग्राश्च ते गुणाश्च तेषु साराः चिरकालावस्थितयो गुर्वादय एव, तथा च जठराग्निसंयोगेनापि न मधुरादिरसवत् स्वभावमेते जहति । सर्तेः 'सृह स्थिरे' इति धञ्चि सारशब्दः ।

हेमाद्रि भाष्य-अ. हृ. सू. 9/14-16

These eight *Gunas* are stable when they come in contact with *Jatharagni* where as *Madhuradi Rasas* will lose their originality.

2. *Shaktyutkarshat*

तथा अन्येभ्यो मन्दसान्द्रादिभ्यो गुणेभ्यो रसादिभ्यो वा गुर्वादयः शक्त्युत्कर्ष-विवर्तिनः शक्तेः सामर्थ्यस्य उत्कर्षः आधिक्यं, विशेषेण वर्तो विवर्तः विशेषेण भवनं, शक्त्युत्कर्षस्य विवर्तः, स विद्यते येषां त एवम् । हेमाद्रि भाष्य-अ. हृ. सू. 9/14-16

These eight qualities possess more strength than other *Gunas.*

3. *Vyavaharaya Mukhyatwat*

किंच गुर्वादीनां गुणानां व्यवहाराय व्यवहारार्थं मुख्यत्वात्; अन्येभ्यो गुणेभ्यो गुर्वादयः प्रधानभूता इत्यर्थः । तथा च गुर्वादयो गुणा द्रव्ये पृथिव्यादौ रसाश्रयेः । इत्युक्तं, न मधुरादयो गुणा इति । तस्माद् गुर्वादीनां गुणानां व्यवहारमुख्यत्वं रसादिभ्यः । हेमाद्रि भाष्य-अ. हृ. सू. 9/14-16

These eight qualities are commonly mentioned in classical texts and frequently these qualities are used in day to day practice.

4. *Bahwagragrahanat*

बह्वो द्रव्य रसादयो गुर्वादिभिगृहीता भवन्ति । तथा चायुर्वेद शास्त्रेषु रसादिभ्यो गुर्वादीनामग्रे ग्रहणं दृष्टम् । यथा वातादिदोष गुणनिरूपणानां गुर्वादीनां पूर्वं ग्रहणं, न रसादीनाम् । ....बहुगुण गणनायां प्रथमग्रहणात् । हेमाद्रि भाष्य-अ. हृ. सू. 9/14-16

These *Gunas* are mentioned earlier to *Rasa* and these eight qualities are frequently seen in *Dravya.*

3. Virya Vs Active constituents

Virya is considered as 'Active Principles' of a *Dravya.*

There are nine important pharmacologically active principles in plants.

Those are: (i) Alkaloids

(ii) Glycosides

(iii) Oils

(iv) Resins

(v) Oleoresin

(vi) Gums

(vii) Tannins

(viii) Antibacterial substances

(ix) Miscellaneous

(i) Alkaloids

Alkaloids are basic substances containing cyclic nitrogen, which are insoluble in water but combine with acids to form well defined water soluble salts.

E.g. Morphine

The names of all alkaloids end in 'ne'.

(ii) Glycosides

Glycosides are those substances where a sugar is joined to a non-sugar with a either linkage (-o-). However, if the sugar is glucose, the glycoside is called glucoside and if it is an amino sugar then it is called as aminoglycoside.

Sugar -o- Non sugar - Glycoside

Glucose -o- Non sugar - Glucoside

Amino sugar -o- Non sugar - Aminoglycoside

On hydrolysis with mineral acids, all glycosides split up into sugar & non-sugar residues.

The pharmacological activity of a glycoside resides in its non-sugar molecule, called aglycon. The sugar portion, however governs the pharmacokinetic characteristics of the glycoside.

E.g. Cardiac glycoside-Digoxin.

Aminoglycosides are rather obtained from microorganisms and used as antimicrobial agents.

(iii) Oils

Oils may be fixed, volatile (from plants) and mineral.

Fixed oils: These are glycerides of oleic, palmitic and stearic acids. They are non-volatile, have food value and become rancid on prolonged storage. These are obtained by solvent extraction of crushed seeds.

E.g. Castor oil.

Essential (Volatile) oil: These are hydrocarbon terpene or some polymer of it. They are volatile, have no food value, possess aroma. Volatile oils are obtained from leaves or flowers by steam distillation.

Volatile oils are used as

Carminatives-E.g. Ginger

Antiseptics-E.g. Thymol for mouth wash

Counter irritants-E.g. Oil of wintergreen

Flavouring agents-E.g. Oil of peppermint

Pain relieving agents-E.g. Oil of clove in case of tooth ache.

Mineral Oil: These are mostly petroleum products and are obtained by dry distillation of woods. These have no food value, mainly used for preparation of ointments.

E.g. Paraffin

(iv) Resin

These are formed by oxidation or polymerization of volatile oils and are insoluble in water but soluble in alcohol.

E.g. Benzoin, shellac

(v) Oleoresin

They are mixtures of volatile oil & resins.

(vi) Gums

These are secretary products of plants. These are the colloidal exudates which either swell or dissolve to form adhesive mucilage in water. These are used as emulsifying or suspending agents.

E.g. Gum acacia

(vii) Tannins

These are non-nitrogenous plant constituents characterized by their astringent action upon mucous membranes they precipitate from the cells of mucous membrane and thus exert a protective action. Substances which release tannic acid in small intestine were used for treatment of diarrhoea.

E.g. Catechu

(viii) Antibacterial

These are derived from moulds, bacteria & fungi.

E.g. Penicillin

(ix) Miscellaneous

Phytochemicals such as flavonoids, terpenes and retinoids.

4. *Guna Virya Vada* or *Paribhashika Virya Vada*

Acharya Sushruta and *Vagbhata* have strongly proposed this theory. Even *Charaka* has mentioned *Guna Viryas*.

This *Virya Vada* may be divided into two as (i) *Ashtavidha Virya Vada* & (ii) *Dwividha Virya Vada*.

(i) *Ashta Vidha Virya Vada*

Acharyas who put forward this concept have given the reason that the eight qualities among 20 *Gurvadi Gunas* possess more strength than others. Hence they are considered as *Viryas*.

Charaka's View

मृदु-तीक्ष्ण-गुरु-लघु-स्निग्ध-रूक्षोष्ण-शीतलम् । वीर्यमष्टविधं केचित्, ... ॥

च. सू. 26/64

Eight *Viryas* mentioned by *Charaka* are.

1. *Mradu*	2. *Tikshna*	3. *Guru*
4. *Laghu*	5. *Snigdha*	6. *Ruksha*
7. *Ushna*	8. *Shita*	

Sushruta's View

केचिदष्टविधमाहुः-शीतं, उष्णं, स्निग्धं, रूक्षं, विशदं, पिच्छिलं, मृदु, तीक्ष्णं चेति ।

सु. सू. 40/5

Eight *Virya* as per *Sushruta* are.

1. *Shita*	2. *Ushna*	3. *Snigdha*
4. *Ruksha*	5. *Vishada*	6. *Picchila*
7. *Mradu*	8. *Tikshna*	

Note: *Sushruta* has mentioned *Picchila* and *Vishada* in place of *Guru* and *Laghu Virya,* but while explaining about importance of *Virya* over *Rasa, Guru* & *Laghu* has been mentioned.

View of Vagbhata of *Ashtanga Sangraha*

वीर्यं तु केचित् गुरु-लघु-स्निग्ध-रूक्ष-तीक्ष्ण-मन्द शीतोष्ण भेदनाष्टविधमाहुः ।

अ. सं. सू. 17/12

1. *Guru*	2. *Laghu*	3. *Snigdha*

4. *Ruksha* 5. *Tikshna* 6. *Manda*

7. *Shita* 8. *Ushna*

Note: *Manda Virya* is mentioned in place of *Mradu Virya*.

View of *Vagbhata* of *Ashtanga Hradaya*

वीर्यं पुनर्वदन्त्येके गुरु स्निग्धं हिमं-मृदु । लघु रूक्षोष्णं-तीक्ष्णं च तदेवं मतमष्टधा ॥

अ. हृ. सू. 9/12-13

He also opines that there are eight *Virya*.

1. *Guru* 2. *Snigdha* 3. *Hima* (*Shita*)

4. *Mradu* 5. *Laghu* 6. *Ruksha*

7. *Ushna* 8. *Tikshna*

Dwividha Virya Vada

All most all *Acharya* have supported this view of two kinds of *Viryas*.

View of *Charaka*

......केचिद् द्विविधमास्थिताः । शीतोष्णमिति; .... । च. सू. 26/64-65

Virya are of two kinds-*Shita* and *Ushna*.

Sushruta View

तच्च वीर्यं द्विविधम्-उष्णं, शीतं च, अग्नीषोमीयत्वाज्जगतः । सु. सू. 40/5

Sushruta also supported this theory of two *Virya* viz. *Ushna* and *Shita* with reason. He opined that *Agni* and *Soma* are dominant in the universe; hence *Virya* is of two types.

Ashtanga Sangraha

अग्नी-षोमात्मकत्वादान-विसर्ग विभागेन कालस्य चोष्ण शीतात्मकत्वाद् द्विविधमेवामनन्ति । एवं चाहुः- नानात्मकमपि द्रव्यमग्नी-षोमौ महाबलौ । व्यक्ताव्यक्तं जगदिव नातिक्रामति जातुचित् ॥

अ. सं. सू. 17/14

Even though there are innumerable substances in the universe they are governed by two qualities namely *Ushna* (*Agni*) & *Shita* (*Soma*). Hence *Virya* is of two types as there are two *Kalas* like *Adana* and *Visarga Kala*.

View of *Ashtanga Hradayakara*

उष्णं शीतं द्विधैवान्ये वीर्यमाचक्षतेऽपि च । नानात्मकमपि द्रव्यमग्नीषोमौ महाबलौ ।

व्यक्ताव्यक्तं जगदिव नातिक्रामनि जातुचित् ॥ अ. हृ. सू. 9/17-18

उष्ण-शीतगुणोत्कर्षात्तत्र वीर्यं द्विधा स्मृतम् ॥ अ. हृ. सू. 1/17

He is also of the same opinion and mentions the same reason that as there is dominance of *Ushna* and *Shita Gunas, Virya* is also of two types.

5. *Virya Karmani* (Actions of *Virya*)

1. *Ushna Virya Karma*

तत्र कर्माण्यप्युष्णस्य दहन-पाचन-मूर्च्छन-स्वेदन-वमन-विरेचनानि ।

तत्र उष्णा.........वातघ्नौ । सु. सू.

तत्रोष्णं दहन-पचन-स्वेदन-विलयनानिल कफशमनानि करोति । अ. सं. सू. 17/16

तत्रोष्ण वीर्यस्य दहनादीनि कर्माणि । इन्दु

तत्रोष्णं भ्रम-तृड्-ग्लानि-स्वेद-दाहाशुपाकिताः । शमं च वात-कफयोः करोति ।

अ. हृ. सू. 9/18-19

उष्णं कफवातहरं पित्तकरम् । द्रव्यगुणसंग्रहः धान्यवर्ग/8

Virya	*Dosha Karma*	*Karma*
Ushna Virya	*Vatahara Kapha* *Vilayana* (*Kaphahara*)	*Dahana* (Burning sensation) *Pachana* (Digests) *Murchana* (Cause fatigue) *Swedana* (Induce sweating) *Vamana* (Induce vomiting) *Virecana* (Cause purgation) *Bhrma* (Cause giddiness) *Trat* (Induce thirst) *Glani* (Cause discomfort)

2. *Shita Virya Karma*

शीतस्य-प्रह्लादन-विष्यन्दन-स्थिरीकरण-प्रसादन-क्लेदन-जीवनानि ।

शीत.........पित्तघ्ना । सु. सू. 41/11

शीतं ह्लादन-स्तम्भन-जीवन-रक्तपित्तप्रसादनादीनि । ....शिशिरं पुनः ।

ह्लादनं जीवनं स्तम्भं प्रसादं रक्तपित्तयोः । अ. हृ. सू. 9/19

शीतं-कफमारुतकृत् । शिवदास सेन-द्रव्यगुण संग्रहः धान्यवर्ग 8

Virya	*Dosha Karma*	*Karma*
Shita Virya	*Kaphavatakara* *Pittahara*	*Prahladana* (Refreshing) *Vishyandana* (Flowing) *Sthirikarana* (Steadiness) *Prasadana* (Calmness)

		Vamana (Induce vomiting) *Kledana* (Moistening) *Jivana* (Enlivening) *Stambhana* (Obstructing) *Raktaprasadaka* (Good for blood)

3. *Snigdha Virya*

स्निग्धस्य स्नेहन-बृंहण-संतर्पण-वाजीकरण-वयःस्थापनानि, ...स्निग्धौ वातघ्नौ ।

सु. सू. 41/11

Virya	*Dosha Karma*	*Karma*
Snigdha Virya	*Vatahara* *Kaphapittakara*	*Snehana* (Lubricating) *Brhmana* (Nourishing) *Santarpana* (Gratifying) *Vajikarana* (Aphrodisiacs) *Vayasthapana* (Youthfulness)

4. *Ruksha Virya*

रूक्षस्य अनिलवृद्धि-संग्रहण-पीडन-विरुक्षणोपरोपणानि, ...रूक्ष.........श्लेष्मघ्नाः ।

सु. सू. 41/11

Virya	*Dosha Karma*	*Karma*
Ruksha Virya	*Vatakara* *Pittakaphahara*	*Sangrahana* (Grasping) *Pidana* (Distressing) *Virukshana* (Roughening) *Ropana* (Healing)

5. *Vishada Virya*

विशदस्य क्लेदाचूषणविरूक्षणोपरोहणानि, विशदाः श्लेष्मघ्नाः । सु. सू. 41/11

Virya	*Dosha Karma*	*Karma*
Vishada Virya	*Kaphahara* *Vatakara*	*Kledachushana* (Suck moisture) *Virukshna* (Roughening) *Uparohana* (Healing)

6. *Picchila Virya*

पिच्छिलस्योपलेपन-पूरण-बृंहण-संश्लेषण-वाजीकरणानि, पिच्छिलाः पित्तघ्नाः ।

सु. सू. 41/11

Virya	*Dosha Karma*	*Karma*
Picchila Virya	*Pittaghna*	*Upalepana* (Smearing) *Purana* (Filling up) *Brhmana* (Bulk promoter) *Samshleshana* (Binding together) *Vajikarana* (Aphrodisiacs)

7. ***Mradu Virya***

मृदो रक्तमांसप्रसादनसुस्पर्शनानि, मृदु.........पित्तघ्नाः । सु. सु. 41/11

Virya	*Dosha Karma*	*Karma*
Mradu Virya	*Pittahara*	*Raktamamsa Prasadana* (Conducive to *Rakta* & *Mamsa*) *Susparsha* (Soft to touch)

8. ***Tikshna Virya***

तीक्ष्णस्य-संग्रहाचूषणावदारण स्रावणानि, तीक्ष्णा.........श्लेष्मघ्नाः । सु. सू. 41/11

Virya	*Dosha Karma*	*Karma*
Tikshna	*Kaphahara*	*Sangraha* (Supporting) *Achushana* (Sucking up) *Avadarana* (Restricting) *Sravana* (Trickling)

9. ***Guru Virya***

.........गुरु.........उपलेप.........आदिना । गुरु.........वातघ्ना । सु. सू. 46/518

Virya	*Dosha Karma*	*Karma*
Guru	*Vatahara*	*Upalepa* (Anointing)

10. ***Laghu Virya***

.........लघवो.........लेखनादिना । लघु.........श्लेष्मघ्नाः । सु. सू. 46/511

Virya	*Dosha Karma*	*Karma*
Laghu	*Kaphahara*	*Lekhana* (Scraping)

6. *Virya Upalabdhi Hetavaha* (Assessment of *Virya*)

वीर्यं यावदधीवासान्निपाताच्चोपलभ्यते । च. सू. 26/66

अधीवासः सहावस्थानं, यावदधीवासादिति यावच्छरीरनिवत्सात; एतच्च विपाकात् पूर्वं

निपाताच्चोर्ध्वं ज्ञेयम् । निपाताच्चेति शरीर संयोगमात्रात्; तेन किंचिद्वीर्यमधीवासादुपलभ्यते, यथा- आनूप मांसादेरुष्णत्वं; किञ्चिच्च निपातादेव लभ्यते, यथा मरीचादीनां तीक्ष्णत्वादि; किञ्चिच्च निपाताधीवासाभ्यां, यथा मरीचादीनामेव । एतेन रसः प्रत्यक्षेणैव; वीर्यं तु किंचिदनुमानेन, यथा सैन्धवगतं शैत्यमानूपमांसगतं वा औष्ण्यं, किञ्चिच्च वीर्यं प्रत्यक्षेणैव, यथा राजिकागतं तैक्ष्ण्यं घ्राणेन, पिच्छिलविशदस्निग्धरूक्षादयः चक्षुः स्पर्शनाभ्यां निश्चीयान्त इति वाक्यार्थः ।

चक्रपाणि भाष्य-च. सू. 26/66

The *Virya* of a *Dravya* is perceived through two means, viz. *Adhivasa* (*Anumana*-Inference) and *Nipata* (*Pratyaksha*-Directly).

Cakrapani gives several examples in this regard.

Sl. No.	Means of Perception	*Pramana*	Example	*Virya*
1	*Adhivasa*	*Anumana*	*Anupamamsa*	*Ushna*
2	*Nipata*	*Pratyaksha*	*Maricha*	*Tikshna*
3	*Both Adhivasa & Nipata*	Both *Anumana & Pratyaksha*	*Maricha*	*Ushna*
4	*Adhivasa*	*Anumana*	*Saindhava Lavana*	*Shita*
5	*Nipata*	*Pratyaksha*	*Rajika*	*Tikshna*

Here *Adhivasa* (*Anumana*) means after knowing the *Karma* done by the *Dravya,* inferring its *Virya. Nipata* (*Pratyaksha*) means directly the *Virya* of a *Dravya* is perceived through sense organs. When a *Dravya* comes in contact with any of the sense organ it is grouped under *Nipata. Viryas* like *Picchila, Vishada, Snigdha, Ruksha* etc. are perceived through *Cakshurindriya* (Eye), *Tikshna Virya* may be perceived through *Ghranendriya* (Nose) etc.

Sushruta's View

तेषां मृदुशीतोष्णाः स्पर्शग्राह्याः, पिच्छिलविशदौ चक्षुः स्पर्शाभ्यां, स्निग्धरूक्षौ चक्षुषा, तीक्ष्णो मुखे दुःखोत्पादनात् । सु. सू. 42/11

Sushruta has enumerated eight types of *Virya* and proposed the concept that how these are perceived.

Sl. No.	*Virya*	Means of Perception
1	*Shita*	*Sparshanendriyagrahya* (Touch)
2	*Ushna*	*Sparshanendriyagrahya* (Touch)
3	*Mradu*	*Sparshanendriyagrahya* (Touch)

4	*Picchila*	Both *Sparshanendriyagrahya* & *Chaksurindriyagrahya* (Touch & vision)
5	*Vishada*	Both *Sparshanendriyagrahya*, *Caksurindriyagrahya* (Touch + Vision)
6	*Snigdha*	*Chaksurindriyagrahya* (By observing)
7	*Ruksha*	*Chaksurindriyagrahya* (By observing)
8	*Tikshna*	*Mukha* (*Ghrana*) Through tongue or nose

Upalabdhi* of *Guru* and *Laghu Virya

एतच्च वीर्यं सहजं कृत्रिमं च ज्ञेयम् । एतच्च यथा संभवं गुरुलध्वादिषु वीर्येषु लक्षणं ज्ञेयम् ।
चक्रपाणि भाष्य-च. सू. 26/66

एतच्च वीर्यं सहजं कृत्रिमं च ज्ञेयम्, तत्राद्यां माषाणां गौरवं मुद्गानां लाघवमित्यादि, कृत्रिमं तु लाजादीनां लघुत्वामित्यर्थः । शिवदास सेन भाष्य-च. सू. 26/66

There will be *Sahaja* (Natural) and *Kratrima* (Artificial) *Viryas*. Processing of *Dravyas* may change its *Virya*. E.g. Fried paddy has *Laghu Virya*.

Charaka has included *Guru* and *Laghu Virya* among *Ashtavidha Viryas*.

Examples: (1) *Guru Virya-Masha*

(2) *Laghu Virya-Mudga*

7. Clinical application and Research Updates

Virya (Potency) of a drug is very much responsible for the *Karma* (Pharmacological action) done by the *Oushadhi Dravya* (Medicine) as it is the most potent factor residing in a *Dravya*. In the treatment the *Dravya* having good potency is always utilized not the one which is less potent or without potency. In case of *Vata* and *Kapha Vyadhi* it is the *Dravya* having *Ushna* Virya is selected and in case of *Pittaja Vyadhi* it is the *Dravya* having *Shita* Virya is selected for the treatment purpose.

Research Method: Assessment of *Virya*

Detection of *Virya*: Exothermic - Endothermic reaction

a. Aim : To determine the *Virya* of given sample by exothermic or endothermic reaction.

b. Materials :

- Drug sample
- Beaker
- Calorimeter
- Distilled water
- Stirrer

c. Principle : *Ushnatwa* and *Shitatwa* of substances are physically related to temperature. So, drugs having *Ushna Virya*, when mixed with distilled water undergoes exothermic reactions and dissipates heat. Whereas drugs having *Shita veerya*, when mixed with distilled water, undergoes endothermic reactions and absorbs heat.

d. Procedure

- 40 ml distilled water was taken in the glass beaker in the calorimeter and it was closed with its wooden lid.
- Initial temperature of the distilled water was noted by immersing industrial thermometer inserted through hole in the lid.
- *Choorna* (Powder) of the drug and water were taken in the ratio of 1:4.
- After removing the lid of calorimeter 10gm of *Choorna* (Powder) was added to the distilled water in the calorimeter and stirred thoroughly using a glass rod for 2 minutes and closed again with its lid.
- The solution was kept stable for 1 minute.
- After that temperature was measured using the industrial thermometer by immersing the bulb of the thermometer completely.
- The reading was taken after 1 minute, when the rise/fall in the mercury column of the thermometer remained constant.
- Thereafter, the thermometer was taken from the solution and its bulb was cleaned and the calorimeter was left undisturbed.
- After 15 minutes, the lid of calorimeter was opened and the solution in it was stirred again with a glass rod stirrer for 2 minutes and the temperature was noted after closing the calorimeter.
- The procedure was repeated every 15 minutes for 2 hours.

Inference: The Drug absorbs temperature may be inferred having *Shita Virya* (Cold Potency) and which dissipates heat is inferred as having *Ushna Virya* (Hot Potency)

Exercises: Multiple Choice Questions (MCQ)

1. 'Yena Kurvanti Tat' refers to

   a. Rasa b. Vipaka c. Virya d. Prabhava

   Ans: c. Virya

2. Dwividha Virya are

   a. Ruksha & Shita b. Ushna & Shita

   c. Ushna & Ruksha d. Shita & Snigdha

   Ans: b. Ushna & Snigdha

3. Vishada & Picchila Virya are mentioned by
   a. Charaka b. Vagbhata c. Nimi d. Sushruta
   Ans: d. Sushruta
4. Guna Virya Vada is also known as
   a. Karma Virya Vada b. Paribhashika Virya Vada
   c. Shakti Virya Vada d. Dravya Virya Vada
   Ans: b. Paribhashika Virya Vada
5. Ushna Virya has predominance of ——— Mahabhuta
   a. Agni b. Ap c. Akasha d. Prithvi
   Ans: a. Agni
6. Vataghna Karma is done by —— Virya
   a. Shita b. Ushna c. Ruksha d. Laghu
   Ans: b. Ushna
7. Pittaghna Karma is done by——— Virya
   a. Ushna b. Laghu c. Shita d. Tikshna
   Ans: c. Shita
8. Stambhana Karma is attributed to
   a. Ushna b. Shita c. Drava d. Snigdha
   Ans: b. Shita
9. Dipana Karma is attributed to
   a. Drava b. Snigdha c. Ushna d. Shita
   Ans: c. Ushna
10. Swedana Karma is attributed to
   a. Snigdha b. Ushna c. Shita d. Guru
   Ans: b. Ushna
11. Rakta Pitta Prasadaka Karma is attributed to
   a. Snigdha b. Shita c. Ushna d. Tikshna
   Ans: b. Shita
12. Adhivasa & Nipata are the two means to perceive
   a. Vipaka b. Rasa c. Prabhava d. Virya
   Ans: d.Virya
13. Shita Virya has the dominance of ——— Mahabhuta
   a. Agni b. Agni & Vayu c. Agni & Akasha d. Ap
   Ans: d. Ap

7 Chapter

Prabhava Vijnana

Contents

- *Prabhava Lakshana* (Characteristic Features of *Prabhava*)
- Concept of *Prabhava* with Various examples
- Swarupa of *Prabhava*
- *Prabhava janya Karma* (Actions done by *Prabhava*)
- Concept of *Samana Pratyarabdha* and *Vichitra Pratyarabdha*
- *Prakrati Samasamaveta* and *Vikrati Vishama Samaveta*
- *Prabhava* Visa-Vis *Vicitrapratyarabdatwa*
- Clinical importance of *Prabhava*

1. *Prabhava Lakshanam* (Characteristic Features of *Prabhava*)

रसवीर्यविपाकानां सामान्यं यत्र लक्ष्यते । विशेषः कर्मणां चैव प्रभावस्तस्य स स्मृतः ॥

च. सू. 26/67

प्रभावलक्षणमाह-रसवीर्येत्यादि । सामान्यमिति तुल्यता । विशेषः कर्मणामिति दन्त्याद्याक्ष्याणां विरेचनत्वादीनाम् । सामान्यं लक्ष्यत इत्यनेन रसादिकार्यत्वेन यन्नावधारयितु शक्यते कार्यं तत् प्रभावकृतिमिति सूचयति, अत्र एवोक्तं प्रभावोऽचिन्त्य उच्यते, रसवीर्यविपाककार्यतयाऽचिन्त्य इत्यर्थः । चक्रपाणि-च. सू. 26/67

Prabhava is a special action exhibited by the *Dravya* which cannot be explained with respect to its *Rasa, Virya* and *Vipaka.*

Chakrapani gives same explanations but he calls it as *Achintya Shakti.*

रसादि साम्ये यत्कर्मविशिष्टं तत्प्रभावजम् । अ. सं. सू. 17/32

एवं रसाद्याः ज्ञाताः प्रभावस्तु न ज्ञातः, अतस्तद्विज्ञानार्थमुच्यते रसादीत्यादि । रसवीर्यविपाकानां परस्पर साम्येऽपि यद्यद्विशिष्टं कर्म दृश्यते तत्तत् प्रभावजं विद्धि । एवतावतैतदुक्तं भवति विशिष्टा सर्वातिशायिनी द्रव्यशक्तिः प्रभावशब्दवाच्या । तस्य च प्रभावजस्य कर्मण उदाहरणमुच्यते दन्तीत्यादि ।

भाष्य

Vagbhata also opines the same that, the peculiar action of one *Dravya* seen even when the *Rasa, Virya, Vipaka's* are similar with those of another *Dravya.* Because of this inexplicable nature the action is said to be *Prabhavajanya.*

रसवीर्यविपाकादिगुणातिशयवानलम् । द्रव्यस्वभावो निर्दिष्टः यः प्रभावः स कीर्तितः ॥

अ. द. भाष्य-अ. हृ. सू. 9

Arunadatta also opines in a similar manner, that the peculiar unexplainable action brought about by the *Dravya* may be considered as *Prabhava.*

रसगुणभूतसमुदायाश्रय एवानवधारणः । तथा रसभूतसमुदायानामन्येषामन्यथावीर्यत्वात् ॥

र. वै. 4/28

Badanta Nagarjuna has termed *Prabhava* as *Anavadharaniya* which is not under the control of *Rasadi Gunas.*

अमीमांस्यान्यचिन्त्यानि प्रसिद्धानि स्वभावतः । आगमेनोपयोज्यानि भेषजानि विचक्षणैः ॥

सु. सू. 40/19

Even though direct references regarding *Prabhava* is not available in *Sushruta Samhita,* word *'Achintya'* is referred to the drugs where one cannot explain the mode of action, which may be considered for *Prabhava.* He has mentioned *Khadira, Tuvaraka, Haridra* etc. which alleviates *Kushta* as example for *Prabhava.*

2. Various examples are given for *Prabhava* in classical literature

1. *Chitraka* (*Plumbago zeylanica*) and *Danti* (*Baliospermum montana*)

कटुकः कटुकः पाके वीर्योष्णश्चित्रको मतः । तद्वद्दन्ती प्रभावस्तु विरेचयति मानवम् ॥

च. सू. 26/68

अस्यैव दुरभिगमत्वादुदाहरणाति बहून्याह कटुक इत्यादिना । तद्वदिति चित्रकसमानगुणा । ....प्रभावश्चेद द्रव्यशक्तिरभिप्रेता, सा च द्रव्याणां सामान्यविशेषः दन्तीत्वादियुक्ता शक्तिरेव, यतः शक्तिर्हिस्वरूपमेव भावानां नातिरिक्तं किंचिद्धर्मान्तरम्; एव प्रदेशान्तरोक्तगुण प्रभावादिष्वपि वाच्यं; यथोक्तं ' 'द्रव्याणि हि द्रव्यप्रभावात् गुणप्रभावात्'' इत्यादि । न च वाच्यं दन्त्यादि स्वरूपत एव विरेचयति, तेन किमिति जलाद्युपहता दन्ती न विरेचयतीति; प्रतिबन्धका भावविशिष्ट-स्यैव प्रभावस्य कारणत्वात्, जलोपहतायां दन्त्यां जलोपद्यातः प्रतिबन्धक इत्याद्यनु-सरणीयम् ।

चक्रपाणि भाष्य-च. सू. 26/68

चित्रकः कटुको रसे पाके च, वीर्ये चोष्णः तस्य तस्य कार्य सामान्यकटुरसस्य यत् कार्यं, कटुविपाकस्य यत् कार्य, उष्णवीर्यस्य च यतृ कार्यं तल्लक्ष्यते, न चाधिकं कर्म लक्ष्यते, तद्वद्दन्ती रसे पाके च कटुका, वीर्ये चोष्णा, तद्रसविपाकवीर्याणां कर्माणि शुक्रहननादीनि यानि तेषां मध्ये सामान्यं लक्ष्यते, विशेषस्तु विरेचनं कर्म लक्ष्यते, तत् प्रभावान्मान्नवं विरेचयति ।

गणनाथ सेन भाष्य-च. सू. 16/68

दन्ती रसाद्यैस्तुल्यापि चित्रकस्य विरेचनी । अ. सं. सू. 17/31; अ. हृ. सू. 9/26-27

Sl. No.	*Dravya*	*Rasa*	*Vipaka*	*Virya*	*Karma*
1	*Chitraka*	*Katu*	*Katu*	*Ushna*	*Dipana*
2	*Danti*	*Katu*	*Katu*	*Ushna*	*Virechaka*

Here both *Chitraka* and *Danti* have *Katu Rasa, Katu Vipaka* and *Ushna Virya* but *Chitraka* acts as *Dipaka* where as *Danti* acts as *Virechaka*. The *Virechana Karma* exhibited by *Danti* is considered as *Prabhavajanya Karma.*

2. *Yashtimadhu* (*Glycyrrhiza glabra*) and *Mradwika* (*Vitis vinifera*)

मधुकस्य च मृद्वीका । अ. सं. सू. 17; अ. हृ. सू. 9/27

मधुकस्य रसाद्यैः सादृऽयपि द्राक्षा विरेचनी, न मधुकमिति प्रभावकर्म ।

इन्दु भाष्य; अ. सं. सू. 17

Here both *Yashtimadhu* and *Mradwika* are having *Madhura Rasa, Madhura Vipaka* and *Shita Virya* but their actions are different. *Mradwika* cause *Virecana,* whereas *Yashtimadhu* won't. Here the *Karma* of *Yashtimadhu,* that which doesn't cause *Virechana* is an example for *Prabhava.*

3. *Kshira* (*Milk*) and *Ghrata* (*Ghee*)

घृतं क्षीरस्य दीपनम् । अ. सं. सू. 17; अ. हृ. सू. 9/27

क्षीरस्य रसाद्यैः सदृशमपि घृतं दीपनं व क्षीरमिति प्रभावः । इन्दु भाष्य-अ. सं. सं. सू. 17

Sl. No.	*Dravya*	*Rasa*	*Vipaka*	*Virya*	*Karma*
1	*Kshira*	*Madhura*	*Madhura*	*Shita*	*Agni mandyakara*
2	*Ghrata*	*Madhura*	*Madhura*	*Shita*	*Dipana*

Even though both *kshira* and *Ghrata* are having *Madhura Rasa, Madhura Vipaka* and *Shita Virya, Kshira* will act as *Agnimandya Kara* where as *Ghrata* increases *Agni.*

4. *Kaphavatahara Karma* of *Lashuna* (*Allium sativum*)

कटुपाकरसस्निग्ध गुरुत्वैः कफवातजित् । लशुनो वातकफकृन्न तु तैरेव यद्गुणैः ॥

अ. सं. सू. 17

लशुनः कटुरसत्वेन कटुविपाकित्वेन कफजित् स्निग्धत्वेन गुरुत्वेन वातजित्, स लशुनः स्वरेव गुणैर्वातकफौ न करोतीति प्रभावः । तेनैतदुक्तं भवति-कटुरस-विपाकौ तु लशुने कफच्छित्वे द्रव्यप्रभावात् पर्याप्तौ, न तु वातकरत्वे; तथा तत्र स्निग्धत्वं गुरुत्वं च वातजित्वे द्रव्यप्रभावात् पर्याप्तं, न तु श्लेष्मकरत्वं इति । इन्दु भाष्य-अ. सं. सू. 17

Lashuna, because of its *Katu Rasa* and *Katu Vipaka* acts as *Kaphashamaka* and owing to its *Snigdha & Guru Gunas* does *Vata Shamana.* Even though it is having *Katu Rasa* and *Katu Vipaka* won't aggravate *Vata* and *Snigdhatwa & Gurutwa* won't aggravate *Kapha.* Here the *Karma Vatakaphahara* is considered as *Prabhava.*

5. *Raktashali* (*Red rice*) and *Yava* (*Hordeum vulgare*)

मिथो विरुद्धान् वातादीन् लोहिताद्या जयन्तियत् । कुर्वन्ति यवकाद्याश्च तत् प्रभावविज्रम्भितम् ॥

अ. सं. सू. 17

परस्परविरुद्धानपि वातादीन् रक्तशालिः स्निग्धत्वेन गुरुत्वेन नाशयति, यवकश्च तानेव करोतीति प्रभावकर्म ।

Sl. No.	*Dravya*	*Rasa*	*Guna*	*Virya*	*Karma*
1	*Raktashali*	*Madhura*	*Snigdha*	*Shita*	*Vatahara*
2	*Yava*	*Madhura*	*Snigdha, Guru*	*Shita*	*Vatakara*

Here both *Raktashali* and *Yava* have similar properties but *Raktashali* is *Vatahara* and *Yava* is *Vatakara. Rakta Shali* has *Vatahara* action on the basis of its properties, but *Yava* is *not. Vatakara* of *Yava* is *Prabhava.*

6. *Vishaghna Karma* of *Shirisha* (*Albizzia lebbeck*)

विषं विषघ्नयुक्तं यत् प्रभावस्तत्र कारणम् । च. सू. 26/69

विषघ्नमुक्तमिति तस्माद्दंष्ट्राविषमौलं इत्यादिना । ....नैयायिक शक्तिवादे या च विषस्य विषघ्नत्वे उपपत्तिरुक्ता......... । चक्रपाणि भाष्य-च. सू. 26/69

शिरीषादि विषं हन्ति स्वप्नाद्यं तद्विवृद्धये । अ. सं. सू. 17

शिरीषहरिद्रादिकं विषं नाशयति, स्वप्नभेद्यादि च तदेव विषं वर्धयति, तत् प्रभावकर्म ।

इन्दु भाष्य-अ. सं. सू. 17

Shirisha and *Haridra* are considered as *Vishaghna Dravyas* (One which reduces poisonous effects) and *Swapna* (Sleep) and *Megha* (Cloudy atmosphere) are aggravating the poisonous condition. Here both *Vishaghna* and *Vishavardhaka Karmas* are said as *Prabhavajanya Karma.*

7. *Manidharana* (Wearing Precious Stones)

Sometimes wearing precious stone will yield good effects.

8. *Mantra* (*Hymns*)

Chanting of *Mantra* will also yield some effects which are considered under *Prabhava.*

9. *Shalyaharana*

Removal of foreign body by certain *Dravyas* is also an example for *Prabhavajanya Karma.*

10. *Vamana* and *Virecana*

ऊर्ध्वानुलोमिकं यच्च तत् प्रभावप्रभावितम् । च. सू. 26/69

ऊर्ध्वाधोगामित्वविरोध लक्षण साऽन्तर्भागत्वात् प्रभावादेव भवति । चक्रपाणि भाष्य-च. सू. 26/69

ऊर्ध्वाधोभागिकं यच्च द्रव्यं । अ. सं. सू. 19

यच्च द्रव्यं मदनफलादि ऊर्ध्वंदेहे गच्छति, हरीतक्यादि वाऽधः ततप्रभावात् ।

इन्दु भाष्य-अ. सं. सू. 17

If a *Dravya* is having *Vamaka Karma,* then it is attributed to *Urdhwabhagahara Prabhava.*

E.g. *Vamana Karma* by *Madanaphala* (*Randia dumetorum*)

Virechana Karma done by the *Dravya* is attributed to *Adhobhagahara Prabhava* of that *Dravya.*

E.g. *Anulomana Karma* of Haritaki (*Trminalia chebula*).

3. *Swarupa* of *Prabhava*

अत एव सर्वातिशयी द्रव्यस्वभावः प्रभाव इत्याम्नातः । अ. शं. शू. 17/13

अनयैव युक्त्या यो द्रव्यस्य सर्वगुणातिशायी स्वभावः स प्रभावशब्देनोक्तः । तेनैतदुक्तं भवति-यथैव गुर्वादीनां कार्यकर्तृत्वे प्राधान्यापेक्षया वीर्यत्वं तथैव गुर्वादीनां प्राधान्यापेक्षया कस्याश्चिच्छक्तेः सर्वातिशायित्वात् संज्ञा प्रभाव इति । न हि ताह्यतिरिक्तेषु रसादिषु कल्प्यमानेषु दृश्यते । अतः स्वभाव विशेष एरा सः । इन्दु भाष्य-अ. शं. शू. 17/15

All *Acharyas* have considered *Virya* and *Prabhava* as *Shakti* (Force/potency) of a *Dravya.* Even though *Virya* is a strong factor but it performs action according to the *Gurvadi Gunas* which may be explained (*Chintya*) where as *Prabhava* is one which cannot be explained (*Achintya*) based on *Gurvadi Gunas.* Hence it is considered as an exceptional power of drug.

व्सेन वीर्येण गुणैश्च कर्म द्रव्यं विपाकेन च यद्विदध्यात् ।

सद्योऽन्यथा तत्कुरुते प्रभावाद्देतेरतस्तत्र न गोचरोऽस्ति ॥ अ. शं. शू. 17/32

एतमेव प्रभावार्थमुपसंहति-रसेनेत्यादि । रक्षादिभिकरणैर्द्रव्हां यतः कर्मकरोति तत् प्रभावेनान्यथा कुरुते विपरीतयतीत्यर्थः । अतस्तस्य प्रभावहेतोमार्गणा न शक्यते । तथा विधभावस्वभावत्वात् ।

इन्दु भाष्य on अ. शं. शू. 17/32

Commonly *Dravya* shows its action based on *Rasa, Guna, Virya* or *Vipaka* & if the *Dravya* exhibits extraordinary action irrespective of its *Rasadi Gunas,* where the cause of the action cannot be traced then it is *Prabhava.*

अमीमांस्यान्यचिन्त्यानि प्रसिद्धानि स्वभावतः । आगमेनोपयोज्यानि भेषजानि विचक्षणैः ॥

प्रत्यक्षलक्षणफलाः प्रसिद्धाश्च स्वभावतः । नौषधीर्हेतुभिर्विद्वान् परीक्षेत कदाचन ॥

सहस्रेणापि हेतूनां नाम्बष्ठादिर्विरेचयेत् । तस्मात्तिष्ठेत्तु मतिमानागमे न तु हेतुषु ॥
सु. शू. 40/19-21

Certain principles laid down by *Acharya* should not be argued and if possible only explanations regarding the mode of action may be traced or the actions may be observed directly. If it is not possible to explain not to worry much as the words of *Acharyas* are always true that *Ambashthadigana Dravyas* never cause *Virechana.*

अत्र वीर्यशब्देन द्रव्यस्य द्विविधाऽपि चिन्त्याऽचिन्त्या च शक्तिरुच्यते । तत्र अचिन्त्या शक्तिर्या तत्रान्तरे प्रभाव इत्युच्यते सा ग्राह्या, तस्मैव च वीर्यस्य प्रभावाख्यस्य स्वतन्त्रे 'तद्रव्यमात्मना किञ्चित्' इत्यनेन ग्रहणं ज्ञेयम् । ......अचिन्त्य क्रिया हेतुश्च प्रभावापरपर्याया द्रव्याणां रसादननुरूप कार्य कारणशक्तिः । चक्रपाणि-सु. शं. शू. 40/5

Chakrapani in his commentary on *Sushruta* opined that both *Virya* and *Prabhava* are the *Shakti* of a *Dravya.* Further, says *Prabhava* is exhibiting independent action.

4. *Prabhavajanya Karma* (Actions done by *Prabhava*)

दन्ती रसाद्यैस्तुल्यापि...................... । शिरीषादिर्विषं हन्ति स्वप्नाद्यं तद्विवृद्धये ॥
मणिमन्त्रौषधीनां च यत्कर्म विविधात्मकम् । शल्याहरण पुञ्जन्म रक्षायुर्धीविशादिकम् ॥
दर्शनाद्यैरपि विषं यन्नियच्छति चागदः । विरेचयति यद्रव्यमाशु शुक्रं करोति वा ॥
ऊर्ध्वाधीभागिकं यच्च द्रव्यं यच्छमनादि च । मातादिप्राप्य तत्तच्च यत्प्रपञ्चेन वर्णितम् ॥
तच्च प्रभावजं सर्वमतोऽचिन्त्यः स उच्यते । अ. सं. सू. 17/16

Different actions done by the *Dravyas* are considered as *Prabhavajanya Karmas.*

1. ***Virechana Karma*** done by the *Danti* is given as example for *Prbhavajanya Karma.*
2. ***Vishaghna Karma*** - The *Karma* done by *Shirisha* etc. *Dravya,* which subsides the poisonous effects.
3. ***Vishakara*** - Certain factors are responsible for worsening of poisonous conditions like cloudy atmosphere and sleep.
4. ***Manidharana*** - Special effects felt by the persons wearing precious stones cannot be explained.
5. ***Mantra*** - The effect caused by chanting of *Mantra* or *Shloka.*
6. ***Aushadha*** - Certain drugs shows pharmacological actions which is impossible to explain.
7. ***Shalyaharana*** - Removal of foreign body is also *Prabhavajanya Karma.*
8. ***Punarjanma*** - The concept of rebirth is difficult to explain.
9. ***Rakshoghna*** - Antimicrobial activity of certain *Dravyas* are difficult to describe.

10. ***Dhi/Medhya*** - Some drugs like *Brahmi* improves one's intellect.
11. ***Vashikarana*** - To captivate.
    Capturing a person with supernatural power.
12. ***Agadiya Karma*** - Any antidote for poison may be grouped under *Prabhavajanya Karma.*
13. ***Ashu Shukrakara*** - After administering a *Dravya* which produces *Shukra* immediately is also *Prabhavajanya Karma.*
14. ***Urdhwa Bhagahara*** - *Vamana Karma* cannot be explained completely on the basis of *Rasadi Gunas.*
15. ***Adhobhagahara*** - *Virehcana* is also *Prabhavajanya Karma.* Not many *Dravyas* are having *Virecana Karma.*

5. *Concept* of *Samana Pratyarabdha* and *Vichitra Pratyarabdha*

इति सामान्यतः कर्म द्रव्यादीनां पुनश्च तत् । विचित्र प्रत्यारब्ध द्रव्यभेदेन भिद्यते ॥
स्वादुर्गुरुश्च गोधूमो वातजित्वातकृद्ययवः । उष्णा मत्स्याः पयः शीतं कटुः सिंहो न शूकरः ॥

अ. हृ. सू. 9/27-28

इति प्रकारे, अनेन प्रकारेण द्रव्यरसवीर्यादीनां सामान्येन कर्म व्याख्याताम्; न विशेषेण । यैरेव महाभूतैरसवीर्यादयो द्रव्याश्रिता आरब्धाः, तैरेव तथा भूतैस्तदाश्रयमपि द्रव्यम् । ....विचित्रप्रत्यारब्धं च तद्द्रव्यं च तस्य भेदो विशेषः, तेन विचित्रप्रत्ययारब्ध द्रव्यभेदेन, तत् सामान्योक्तं कर्म द्रव्यादीनां, भिद्यते नानात्वेन सम्पद्यते । द्रव्याश्रितत्वाद्रसादीनां अपि यत्कर्म तदपि द्रव्यभेदेन भिद्यते । ननु, सर्वमपि देशकालादि वशाद्विचित्र प्रत्यारब्धम्, परस्पर वैलक्षण्या-द्रव्याणाम् । परस्पर वैलक्षण्ये चैषां विचित्र प्रत्यारब्धत्वमेव कारणम् । .... स्वादुरसोपेतो गुरुगुणयुक्तश्च गोधूमो मधुररसोपदिष्टं वातजित्वं यत् कर्म तत् करोति, समान प्रत्यारब्धत्वात् । यवस्तु स्वादुरसोपेतो गुरुगुणयुक्तश्च मधुररसोपदिष्टं यद्वाजित्वं कर्म तन्न करोति, अपि तु वातकृत्वमेव करोति, विचित्र प्रत्यारब्धत्वात् मत्स्यः स्वादुरसोपेतो गुरु गुणोपेतश्च न मधुर रसोपदिष्ट शीतवीर्यः किं तर्हि ? उष्णवीर्यः किंचिल प्रत्यारब्धत्वात् । क्षीरं च स्वादुरसोपेतं गुरुगुणयुक्तं च मधुररसोपदिष्टं शीतवीर्यम्, समानप्रत्यारब्धत्वात् । स्वादुरसयुक्तो गुरुगुण युक्तश्च सिंहो न यथा रसं मधुरविपाकः किं तर्हि ? कटुको विपाके, विचित्र प्रत्यारब्धात् । शूकरो मधुररसयुक्तो गुरुगुणोपेतश्च यथारसं मधुरविपाक एव, समान प्रत्यारब्धत्वात् ।

अ. द.-अ. हृ. सू. 9/19-21

Samana Pratyarabdha Dravyas are those, which have their *Rasa, Guna, Vipaka, Virya* in accordance to their *Panchabhautika* composition and show the *Karma* accordingly. E.g. *Godhuma*

Godhuma which has *Madhura Rasa, Guru, Guna, Madhura Vipaka* will have *Vatahara Karma.*

Table showing *Samanapratyarabdha Dravya*

Sl. No.	*Dravya*	*Rasa*	*Guna*	*Vipaka*	*Virya*	*Karma*
1	*Ajamoda*	*Katu*	*Laghu, Ruksha*	*Katu*	*Ushna*	*Dipana*
2	*Ashoka*	*Kashaya*	*Laghu*	*Katu*	*Shita*	*Sthambhaka*
3	*Aragwadha*	*Madhura*	*Guru*	*Madhura*	*Shita*	*Sthambhaka*
4	*Udumbara*	*Kashaya*	*Ruksha*	*Katu*	*Shita*	*Sthambhaka*
5	*Ushira*	*Tikta*	*Ruksha*	*Katu*	*Shita*	*Dahaprashamana*
6	*Karavira*	*Katu*	*Laghu*	*Katu*	*Ushna*	*Kushthaghna*
7	*Krashna Jiraka*	*Katu*	*Laghu*	*Katu*	*Ushna*	*Dipana*
8	*Khadira*	*Kashaya*	*Laghu*	*Katu*	*Shita*	*Sthambhaka*
9	*Gokshura*	*Madhura*	*Guru*	*Madhura*	*Shita*	*Vrashya*
10	*Chandana*	*Tikta*	*Laghu*	*Katu*	*Shita*	*Dahaprashamana*

Vichitrapratyarabdha Dravyas are those which do not have their *Rasa, Guna, Vipaka* and *Virya* in accordance to *Panchabhautika* constitution or one among those five factors will not fall in the rule and sometimes exhibit different *Karma*. E.g. *Yava* (*Hordeum vulgare*). *Yava* is having *Madhura Rasa, Guru Guna* but is *Vatakara.*

Table showing *Vichitrapratyarabdha Dravya.*

Sl. No.	*Dravya*	*Rasa*	*Guna*	*Vipaka*	*Virya*	*Karma*
1	*Agnimantha*	*Tikta*	*Laghu, Ruksha*	*Katu*	*Ushna*	*Shothahara*
2	*Ativisha*	*Tikta*	*Laghu, Ruksha*	*Katu*	*Ushna*	*Grahi*
3	*Ashvagandha*	*Tikta*	*Laghu, Snigdha*	*Madhura*	*Ushna*	*Balya*
4	*Amalaki*	*Amla*	*Guru, Ruksha*	*Madhura*	*Shita*	*Pramehaghna*
5	*Ardraka*	*Katu*	*Guru, Tikshna*	*Madhura*	*Ushna*	*Vatahara*
6	*Eranda*	*Madhura*	*Snigdha, Tikshna*	*Madhura*	*Ushna*	*Kushthaghna*
7	*Guggulu*	*Tikta*	*Laghu*	*Katu*	*Ushna*	*Shothahara*
8	*Guduchi*	*Tikta*	*Guru*	*Katu*	*Ushna*	*Jvarahara*
9	*Dronapushpi*	*Katu*	*Guru*	*Katu*	*Ushna*	*Dipana*
10	*Nagakeshara*	*Katu*	*Laghu*	*Katu*	*Ushna*	*Pachana*

Samana Pratyarabdha/Prakratyanuguna Concept

तेषां रसोपदेशेन निर्दिश्यो गुण संग्रहः । वीर्यतोऽविपरीतानां पाकतश्चोपदेक्ष्यते । यथा पयो............................ ॥ च. सू. 26/46

Charaka says, *Vipaka* and *Virya* of some substances may be assessed on the basis of *Rasa* only and those are considered as *Prakratyanuguna.* E.g. *Paya* (Milk).

Madhura Vipaka and *Shita Virya* of *Paya* is known through *Madhura Rasa.*

Vichitra Pratyarabda/Prakratyananuguna

मधुरं किञ्चिदुष्णं स्यात् कषायं तिक्तमेव च । यथा महत्पञ्चमूलं यथाऽब्जानूपमामिषम् ॥
लवणं सैन्धवं नोष्णमम्लमामलकं तथा । अर्कागुरुगुडूचीनां तिक्तानामुष्णमुच्यते ॥
च. सू. 26/48-49

Some *Dravyas* have the *Viryas* which are contradictory to *Rasa* may be considered under *Vichitra Pratyarabdha* or *Prakratyananuguna.*

E.g. 1. *Brahat Panchamula* has *Ushna Virya* even though it has *Kashaya Tikta Rasa.*
2. *Anupamamsa* is *Madhura* in *Rasa* but has *Ushna Virya.*
3. *Saindhava Lavana, Lavana Rasa* has *Shita Virya.*
4. *Amalaki* has *Shita Virya* even it has *Amla Rasa.*
5. *Arka, Agaru* and *Guduchi* are having *Tikta Rasa* but has *Ushna.*

These are the exceptions and may be considered under *Vichitrapratyarabdha* concept.

6. *Prakrati Samasamaveta* and *Vikrati Vishama Samaveta*

न हि विकृतिविषमसमवेतानां नानात्मकानां परस्परेण चोपहतानामन्यैश्च विकल्पनैर्विकल्पितानामवयवप्रभावानुमानेनैव समुदायप्रभावतत्त्वमध्यवसातुं शक्यम् । च. वि. 1/10

विकृतिविषमसमवेतानामिति विकृतिसमवेतानां तथा विषमसमवेतानां चेति विकृतिविषमसमवेतानाम् । समवेतानमिति मिलितानां रसानां दोषाणां च । तत्र रसस्य विकृति समवायो यथा-मधुरे तण्डुलीयके; मधुरो हि प्रकृत्या स्नेहवृष्यत्वादिकरः, तण्डुलीयके तु विकृति समवेतत्वेन तन्न करोति । विषम समवेतास्तु तिलेकषायकटुतिक्त मधुराः, यदि हीमे रसाः समया मात्रया समवेताः स्युस्ततस्तिलोऽपि पित्तश्लेष्महरास्त्रिदोषहरो वा स्यात्, पित्तकफकरस्त्वयं; तेनात्र रसानां क्वचित् कर्तृत्वमकर्तृत्वं च क्वचिदिति वैषम्यमुन्नीयते । नानात्मकानामित्यादिहेतुत्रयं तु विकृतिसमवायविषमसमवाययोरेवोपलम्भकम् । ....तदेवं दूषणदर्शनादन्यथा व्याख्यायते-यत्-द्विविधो मेलको भवति रसानां दोषाणां च प्रकृत्यनुगुणः, प्रकृत्यननुगुणश्च; तत्र यो मिलितानां प्राकृत गुणानुपमर्देन मेलको भवति, स प्रकृतिसमसमवायशब्दोनोच्यते; यस्तु प्राकृतगुणोवमर्देन भवति, स

विकृतिविषम समवायोऽभिधीयते; विकृत्या हेतुभूतया विषमः प्रकृत्यननुगुणः समवायो विकृति विषम समवाय इत्यर्थः ।

तत्र खल्वनेकरसेषु द्रव्येष्वनेकदोषात्मकेषु विकारेषु रसदोष प्रभावमेवैक-श्वेनाभिसमीक्ष्य ततो द्रव्यविकारयोः प्रभावतत्वं व्यवस्येत् । -भाषा

Prakruti Samasamaveta is a concept where many *Dravyas* having different *Rasas* may be used in diseases originated because of different *Doshas.* If it is combined then it may be used in varieties of diseases may be *Ekadoshaja, Dwidoshaja* etc.

E.g. If four drugs which are acting on *Jwara,* show its action on any *Jwara.*

It cannot be said that always it will be showing its action on diseases of any origin. The combination of two or more *Dravyas* may also be showing bad effects.

E.g. 1. *Madhura Rasayukta Tanduliyaka* has *Snigdha Guna* it will be *Vrashya,* whereas *Vikruta Tanduliyaka* won't have *Vrshyatwa.*

2. *Tila* if it is combined with *Katu, Tikta, Kashaya* & *Madhura Rasa Dravya* in proper combination will be *Pittahara, Shleshmahara,* even *Tridoshahara,* whereas improper use of *Tila* may be *Pitta Kapha Karaka.*

3. Combination of *Matsya* & *Dugdha, Madhu* & *Ghrata* in equal quantity are not showing good effects even though individually they have good qualities.

7. *Prabhava* Visa-Vis *Vichitrapratyarabdhatwa*

1. All *Prabhava Dravyas* may be included under *Vichitrapratyarabda* but all *Vichitra Pratyarabda Dravyas* are not *Prabhava Dravyas.*
2. It is not necessary that all *Vichitrapratyarabdha Dravyas* have extraordinary actions but *Prabhava* is an *Adbhuta Karma* (Extra ordinary action).
3. All the *Dravyas* having difference in their constituents like *Rasa, Guna, Vipaka, Virya* and *Karma* and they are not in accordance with *Panchabhutas* are *Vichitra Pratyarabdha Dravyas,* whereas *Prabhava Dravya* is independent from other factors and importance is given to its special action.
4. Common *Vichitrapratyarabdha Dravyas* apart from *Prabhava Dravyas* will have different chemical structure but exhibit common actions where as *Vichitrapratyarabdha* with *Prabhava* have different chemical structure and have peculiar action like *Vishaghna.*

E.g. 1. *Vichitrapratyarabdatwa- Dadhi*

Dravya	*Rasa*	*Guna*	*Vipaka*	*Virya*	*Karma*
Dadhi	*Madhura, Kashaya*	*Snigdha*	*Amla*	*Ushna*	*Pittakara*

2. *Vichitrapratyarabdha* with *Prabhava-Shirisha*

Dravya	*Rasa*	*Guna*	*Vipaka*	*Virya*	*Prabhava*
Shirisha	*Kashaya, Tikta, Madhura*	*Laghu, Ruksha, Tikshna*	*Katu*	*Ishat Ushna*	*Vishaghna*

8. Clinical importance of *Prabhava*

Concept of *Prabhava* is very much useful from clinical application point of view. The drugs having *Prabhavajanya Karma* (actions due to *Prabhava*) will be very potent and hence they are therapeutically very much beneficial. *Prabhavajanya karma* (actions due to *Prabhava*) is naturally strong and will be able to produce immediate effect.

- *Pancha Karma* (Five purificatory measures) related *Vamana* (emetic therapy), *Virechana* (purgation) etc are attributed to *Prabhava* of *Dravya* viz; *Vamana Karma* (Emetic action) of *Madana Phala* (*Randia dumetorum*) and *Virechana Karma* (Purgative action) of *Trivrit* (*Operculina turpathum*) are the best examples that these drugs are considered as best *Vamaka* (Emetic) and *Virechaka* (Purgative) respectively.
- Application of *Prabhava* is unlimited that the *Vishaghna Karma* (Anti poisonous action) of *Shirisha* (*Albizzia lebbeck*) is much beneficial in dangerous conditions of poisoning *Agadeeya Karma*
- *Medhya Karma* (Memory enhancing) is again beneficial to the individuals seeking improvement in their memory or in improving the mental faculties in *Manasika Vikara* (mental diseases).
- *Mani* (precious stone) and *Mantra* (Hymns) are making the atmosphere conducive so it may directly or indirectly have an influence on diseases.

Exercises: Multiple Choice Questions (MCQ)

1. Achintya Shakti refers to

   a. Virya b. Rasa c. Vipaka d. Prabhava

   Ans: d. Prabhava

2. Virechana Karma of Danti is due to

   a. Virya b. Prabhava c. Vipaka d. Rasa

   Ans: b. Prabhava

3. Vishaghna is a Prabhava Janya Karma of

   a. Shirisha b. Danti c. Chitraka d. Yashtimadhu

   Ans: a. Shirisha

4. Vamana Karma of Madana phala is attributed to
   a. Rasa b. Vipaka c. Prabhava d. Guru
   Ans: c. Prabhava
5. Example for Samana Pratyayarabdha Dravya
   a. Amalaki b. Khadira c. Shunthi d. Guduchi
   Ans: b. Khadira
6. Example for Vichitra Pratyayarabdha
   a. Ashwagandha b. Gokshura c. Chandana d. Ushira
   Ans: a. Ashwagandha
7. Not an example for Prabhava
   a. Madanaphala b. Shirisha c. Trivrit d. Chitraka
   Ans: d. Chitraka

*****

8 Chapter

Interrelation of Rasa-Guna-Virya-Vipaka-Prabhava with respect to their strength – Pharmacodynamics

Dravyas exhibit various actions on consumption. The *Karma* (action) is attributed not to a single factor but for other factors also which reside in that *Dravya* itself. It helps to identify the entity which is responsible for a particular *Karma* exhibited by the drug. It is very necessary to have a prior knowledge about internal relation between the *Dravyagata Padartha* i.e. *Rasa, Guna, Vipaka, Virya* and *Prabhava.* There are three rules in understanding the internal relation.

Rule–I

शीतं वीर्येण यद्रव्यं मधुरं रसपाकयोः। तयोरम्लं यदुष्णं च यद्रव्यं कटुकं तयोः॥
तेषां रसोपदेशेन निर्देश्यो गुणसंग्रहः। वीर्यतोऽविपरीतानां पाकतश्चोपदेक्ष्यते॥
यथापयो यथासर्पिर्यथा वा चव्यचित्रकौ। एवमादीनि चान्यानि निर्दिशेद्रसतो भिषक्॥

च. सू. 26/45-47

Common rule is that the *Dravya* having *Madhura Rasa* will undergo *Madhura Vipaka* and have *Shita Virya, Amla Rasa Dravya* undergo *Amla Vipaka* and have *Ushna Virya* and *Katu. Rasa Dravyas* undergo *Katu Vipaka* and has *Ushna Virya* where as other *Rasas Lavana* which undergo *Madhura VIpaka* and have *Ushna Virya* and *Tikta* & *Kashaya Rasa Dravyas* undergo *Katu Vipaka* and have *Shita Virya* acc to their nature of compositions.

Table showing *Rasa* and respective *Vipaka* & *Virya*

Sl. No.	*Rasa*	*Vipaka*	*Virya*
1	*Madhura*	*Madhura*	*Shita*
2	*Amla*	*Amla*	*Ushna*
3	*Lavana*	*Madhura*	*Ushna*
4	*Katu*	*Katu*	*Ushna*
5	*Tikta*	*Katu*	*Shita*
6	*Kashaya*	*Katu*	*Shita*

E.g. 1. *Kshira* (Milk) has *Madhura Rasa* undergoes *Madhura Vipaka* and will have *Shita Virya.*

2. *Chitraka* has *Kaṭu Rasa* undergoes *Katu Vipaka* and will have *Ushna Virya.*

If a *Dravya* follows this rule then knowledge of any one factor will lead to the assessment of other factors automatically.

Rule–II

किञ्चित् रसेन कुरुते कर्म वीर्येण चापरम्। द्रव्यं गुणेन पाकेन प्रभावेण च किंचिन॥
रसं विपाकरत्तौ वीर्यं प्रभावास्तानपोहति। बलसाम्ये रसादीनामिति नैसर्गिकं बलम्॥

च. सू. 26/71-73

रसवीर्य प्रभृतयो भूतोत्कर्षापकर्षतः। एकरूपा विरूपा वा द्रव्यं समधिशेरते॥
माधुर्यशैत्य पैच्छिल्यस्नेहगौरवमन्दताः। सहवृत्या स्थिताः क्षीरे न त्वानुपौदकमिषे॥

इन्दु–अ. सं. सू. 17/24

The drugs exhibit their actions by virtue of their *Rasa* (Taste) or by their *Virya* (Potency) or by their *Guna* (quality) or by their *Vipaka* (specific change after digestion) or by virtue of their *Prabhava* (unexplainable action).

In case the *Rasa, Vipaka, Virya* and *Prabhava* possess equal strength, by their nature *Vipaka* supersedes *Rasa, Virya* supersedes both *Rasa* & *Vipaka* and it is the *Prabhava* which overcomes all the factors brings out its own *Karma.*

Ashtanga Sangrahakara interprets this concept by various examples.

E.g. 1. *Madhu* (Honey) even though *Madhura* in *Rasa* (Taste) won't aggravate *Kapha* because of *Katu Vipaka* which supersedes *Madhura Rasa* in bringing out *Kapha Shamaka Karma.*

2. *Anupamamsa* (Meat of animals living in Marshy region) even though *Madhura* in *Rasa* and *Vipaka* but aggravates *Pitta* owing to its *Ushna Virya* which overcomes both *Rasa* & *Vipaka.*

3. *Danti* (*Baliospermum montanum*) having *Katu Rasa, Katu Vipaka* and *Ushna Virya* acts as *Recaka* owing to its *Prabhava* which defeats *Rasa, Vipaka* and *Virya* in bringing out its *Recana Karma.*

Rule–III

यद्यद् द्रव्ये रसादीनां बलवत्वेन वर्तते। अभिभूयेतरांस्तान् तत् कारणत्वं प्रपद्यते॥
विरुद्ध गुण संयोगे भूयसाल्पं हि जीयते। अ. सं. सू. 17/31-32; अ. हृ. सू. 1/23-24

If the factors residing in *Dravya* are possessing different strengths, then the one which is stronger will over power other factors and brings out the *Karma.*

तद्रव्यमात्मना किंचित्किंचिद्वीर्येण सेवितम्। किंचिद्रसविपाकाभ्यां दोषं हन्ति करोति वा॥

सु. सू. 40/14

Sushruta also explains in the same way that the different factors which are residing

in the *Dravya* are responsible for particular *Karma*, which aggravate or pacify the *Dosha*.

Dalhana in his commentary on *Sushruta Sutra* 40/14 *Shloka* enumerates different examples.

ननु, तर्हि द्रव्यमेव क्रियाकारि न रसादय इत्याशङ्क्याहतदित्यादि। आत्मना स्वयमेव; द्रव्यमात्मना कृत्वा किञ्चिद्दोषं हन्ति करोति वा, किञ्चिद्द्रव्यमेव वीर्येण कृत्वा हन्ति करोति वा, किञ्चिद्धन्ति करोति वा रसविपाकाभ्यां कृत्वा, सर्वत्र द्रव्यं हनने करणे च कर्तृकारकं; तत्र द्रव्यमात्मना पार्थिवाप्यतैजसवायव्याकाशीयस्वरूपेण दोषं हन्ति; यथा खदिरः कुष्ठं, दोष शब्दोऽत्र व्याधावपि वर्तते; वीर्येण द्विविधेनाष्टविधेन वा सेवितं द्रव्यं दोषं हन्ति, तच्च महत्पञ्चमूलादिक मेतस्मिन्नध्याये कथितमेव; रसेन कृत्वा द्रव्यं दोषं हन्ति, यथा–तिक्ता गुडूच्युष्णवीर्याऽपि पित्तं शमयति; विपाकेन कृत्वा द्रव्यं दोषं हन्ति यथा–शुण्ठी कटुकाऽपि वातं शमयति, मधुर-विपाकत्वात्। डल्हण भाष्य–सु. सू. 40/14

E.g. 1. ***Karma* because of *Prabhava Pradhanyata***–In *Khadira Prabhava* overcomes *Tikta* & *Kashaya Rasa*, *Katu Vipaka* and *Shita Virya* making it as best *Kushthaghna Dravya*.

2. ***Karma* because of *Virya Pradhanyata***–*Brahatpanchamula* has *Tikta Kashaya Madhura Rasa* and *Katu Vipaka* acts as *Vata Shamaka* because of its *Ushna Virya*.

3. ***Karma* because of *Rasa Pradhanyata***–Even though *Guduchi* is *Ushna* in *Virya* acts as *Pitta Shamaka* because of its *Tikta Rasa*.

4. ***Karma* because of *Vipaka Pradhanyata***–*Shunthi* acts as *Vata Shamaka* owing to its *Madhura Vipaka*.

Explanation given by *Acharya Vagbhata*, author of *Ashtanga Sangrahakara* for non-interference of other factors which are opposite to it.

विरुद्धापि चान्योन्यं रसाद्याः कार्यसाधने। नावश्यं स्युर्विधाताय गुणदोष मिथो यथा॥
अ. सं. सू. 17/23

ननु यत्र रसादीनामन्यतमस्य कार्यमितरस्य कार्येण विरुध्यते तत्र कस्य कार्यकलेत्वं भवति? यदि तु प्रभूतस्य स्वभावमलवतश्चेत्युच्यते। तत्राल्पोऽल्पबलश्च किंचित् कर्तुं शक्तो न वेत्येवं प्रष्ट इदमाह-विरुद्धा इत्यादि। रसाद्या रसवीर्यविपाक गुण प्रभावा अन्योन्यं परस्परं विरुद्धा अपि न नाशाय भवन्ति कार्यसाधन काले। दृष्टान्तो-गुणदोषा मिथो यथेति। गुणाः सत्वरजस्तमांसि परस्परं पुरुषाद्यभिधानकार्य-साधने विरुद्धा अपि यथा विधाताय न भवन्ति। दोषाश्च वातपित्तकफा विरुद्धा अपि देहरोगादि साधने यथा मिथो विधाताय न भवन्ति। तद्रसादयोऽपि। इन्दु शशिलेखा–अ. सं. सू. 17/23

Even though the factors residing in *Dravya* are having opposite nature, they won't affect the final outcome of the *Dravya*, as like *Satwa, Raja* & *Tama Guna* and *Vata, Pitta* & *Kapha Doshas*, even they are opposite to one another but they maintain homeostasis of

the body. This can be well appreciated in the drug having multiple pharmacological actions.

Conclusion

If one has idea about these rules, he can easily explain the mode of action of different pharmacological actions exhibited by the *Dravya.*

Exercises: Multiple Choice Questions (MCQ)

1. Madhura Rasa Dravya will have ———Vipaka
   a. Amla   b. Katu   c. Madhura   d. Tikta
   Ans: c. Madhura
2. Lavana Rasa Dravya will have ——— Virya
   a. Shita   b. Ushna   c. Ruksha   d. Drava
   Ans: b. Ushna
3. When all factors are having similar strength then the scenario
   a. Virya overpowers Vipaka & Rasa
   b. Vipaka overpowers Virya
   c. Rasa overpowers Vipaka
   d. Rasa overpowers Virya
   Ans: a. Virya overpowers Vipaka

*****

9 Chapter

Karma Vijnana

Contents

1. *Karma Lakshana* (Characteristics of *Karma*)
2. *Pracina Drishtya Karma Kriya Vivechana* Modern Concept of Drug Action (Pharmacodynamics)
3. *Dravya Karmukata Vividha Parikshana*
4. 4.1 Common Experimental Animals
   4.2 Experimental Models for Select Activities
5. 5.1 *Dipana* 5.2 *Pachana* 5.3 *Samshodhana*
   5.4 *Samshamana* 5.5 *Anulomana* 5.6 *Sramsana*
   5.7 *Bhedana* 5.8 *Rechana* 5.9 *Chedana*
   5.10 *Lekhana* 5.11 *Grahi* 5.12 *Stambhana*
   5.13 *Madakari* 5.14 *Pramathi* 5.15 *Abhishyandi*
   5.16 *Vyavayi* 5.17 *Vikasi* 5.18 *Rasayana*
   5.19 *Vajeekarana* 5.20 *Medhya*
6. Research Updates

1. *Karma Lakshana* (Characteristics of *Karma*)

क्रिया लक्षणं कर्म । र. वै. सू. 8

Kriya i.e. 'Performance' itself is a characteristic feature of *Karma.*

संयोगे च विभागे च कारणं द्रव्यमाश्रितम् । कर्तव्यस्य क्रियाकर्म कर्म नान्यदपेक्षते ॥

च. सू. 1/52

रावं द्रव्यमगुणं संयोगविभागेष्वनपेक्षकारणमिति कर्म लक्षणम् । वै. द. 1/1/17

संयोगविभागवेगानां कर्म समानम् । वै. द. 1/1/20

यत् कुर्वन्ति तत् कर्म । सु. सू. 42/5

Acarya Caraka says, that entity in the *dravya* which is responsible for *Samyoga* (association) and *Vibhaga* (dissociation) is *Karma.* This entity is in an inherent relation with *Dravya* and is responsible for a specific action.

Thus, the following may be considered as the characteristics of *Karma.*

(i) **संयोगे च विभागे च-** The entity should be responsible for *Samyoga* and *Vibhaga.*

(ii) द्रव्यमाश्रितम् - Resides in the *Dravya*. *Karma* has no existence without *Dravya*.

(iii) कर्तव्यस्य क्रिया कर्म - That entity should perform a specific action, attributed to the *Dravya*.

Note: The term '*Karma*' is also used at different contexts to explain:

(i) *Panchakarma*

(ii) *Adrushta Karma*

(iii) *Purvajanma Karma*

(iv) *Prayatnadi Karma*

(v) *Utkshepapakshepadi Karma*

It should be remembered that these are not relevant in the context of *Dravyaguna*.

That entity which performs or executes a specific action *(Aushadhiya Karma)* of the *Dravya* is '*Karma*' in the context of *Dravyaguna*.

2. *Prachina Drishtya Karma Kriya Vivechana*

भौमाप्याग्नेयवायव्याः पञ्चोष्माणः सनाभसा । पञ्चाहारगुणास्वान्स्वान्पार्थिवादीन्पचन्ति हि ॥

च. चि. 15/13

यथा स्वं च पुष्णान्ति देहे द्रव्यगुणाः पृथक् । पार्थिवाः पार्थिवानेव शेषाः शेषांश्च कृत्स्नशः ॥

च. चि. 15/14

सप्तभिर्देहधातारो धातवो द्विविधं पुनः । यथा स्वमग्निभिः पाकं यान्ति किट्टप्रसादवत् ॥

च. चि. 15/15

Ayurveda solely depends on *Panchabhautika* theory and henceforth explain all concepts on this basis only.

Caraka while elaborating on *Bhutagni Paka* & *Jatharagni Paka* says that the *Panchabhautika Ahara* consumed is influenced by their respective *Bhutagni* and nourish the respective *Bhutas* in the body.

The same can be adopted to explain the therapeutic action of *Dravyas* which are also *Panchabhautika* and can influence the *Panchabhautika Sharira*.

गुणा या उक्ता द्रव्येषु शरीरेष्वपि ते तथा । स्थान वृद्धिक्षयास्तस्माद्देहिनां द्रव्यहेतुकाः ॥

सु.सू. 41/12

Gunas which are explained is a component of both *Dravya* and *Sharira*. This will influence the *Sthana-Vraddhi-Kshaya* of the *Dosha Dhatu mala,* which all in turn are made up of *Pancamahabhuta. Dravya Panchamahabhuta Dosha-Dhatu-Mala (Ahara/ Aushadha)*

अनेन निदर्शनेन..............युक्तिर्विशेषमर्थं चाभिसमीक्ष्य स्ववीर्यगुणयुक्तानि द्रव्याणि कार्मुकाणि भवन्ति । तानि यदा कुर्वन्ति स कालः, यत् कुर्वन्ति तत् कर्म, येन कुर्वन्ति तद्वीर्यं, यत्रकुर्वन्ति तदधिकरणं, यथा कुर्वन्ति स उपायः यन्निष्पादयन्ति तत् फलमिति ॥ सु. सू. 41/5

न तु केवलं गुणप्रभावादेव द्रव्याणि कार्मुकाणि भवन्ति; द्रव्याणि हि द्रव्यप्रभावाद्गुणप्रभावाद्द्रव्यगुणप्रभावाच्च तस्मिंस्तस्मिन् काले तत्तदधिकरणमासाद्य तां तां च युक्तिमर्थं च तं तमभि प्रेत्य यत् कुर्वन्ति तत् कर्म, येन कुर्वन्ति तद्वीर्यं, यत्र कुर्वन्ति तदधिकरणं, यदा कुर्वन्ति स कालः, यथा कुर्वन्ति स उपायः, यत् साधयन्ति तत् फलम् ॥ च. सू. 26/13

Caraka opines that there are three means by which the *Karma* is produced. Those are -

(i) *Dravya Prabhava*- Because of its strength dravya gives rise to a *Karma*.

(ii) *Guna Prabhava*- The *Karma* produced by the constituents residing in a *Dravya*.

(iii) *Dravya Guna Prabhava*- It is the combined contribution of both *Dravya* and *Gunas* to produce any *Karma*.

Both *Charaka* and *Sushruta* have given different terms and modalities involved in bringing out a *Karma*.

(i) *Yat Kurvanti Tat Karma*- One which is performing an action *(Kriya)*.

(ii) ***Yen** Kurvanti **Tadviryam***- The potent factor responsible for an action.

(iii) *Yatra Kurvanti Tadadhikaranam*- Where the action is performed that is *Adhikarana*.

(iv) *Yada Kurvanti Sa Kala*- When the action is done that is *Kala*.

(v) *Yatha Kurvanti Sa Upayaha*- How the *Karma* is performed that is *Upaya*.

(vi) *Yat Sadhayanti (Nishpadayanti) Tat Phalam*- The outcome after the action is *Phala*.

यत् कुर्वन्तीत्यादावुदाहरणं यथा- शिरोविरेचन द्रव्याणि यच्छिरोविरेचंन कुर्वन्ति, तच्छिरोविरेचनं कर्मः येनोष्णत्वादिकारणेन शिरोविरेचनं कुर्वन्ति तद्वीर्यं, वीर्यं शक्तिः सा च द्रव्य गुणस्य वाः यत्र शिरोविरेचनं कुर्वन्ति तदधिकरणं शिरः नान्यत्राधिकरणे शिरोविरेचन द्रव्यं प्रभवतीत्यर्थः; यदेति वसन्तादौ शिरोगौरवादियुक्ते च काले, रातेनाकाले शीते शिरोविरेचनं स्तब्धत्वान्न कार्मुकं किन्तु सकाल रावः यथारान प्रकारेण प्रधमावपीडनादिना तथा ''प्रसारिताङ्गमुत्तानं शयने संस्तरासृते । ईषत्प्रलम्बशिरसं संवेश्य चावृतेक्षणम्''- इत्यादिना विधिना कुर्वन्ति, स उपायः; यत् साधयन्ति शिरोगौरव शूलाद्यमुपरमं, तत् फलम्; फलं उद्देश्यम् । कर्म कार्य साधनम्, उद्देश्यं फलं साध्यं, यथा-या गति धर्मः कार्यतया कर्म, तज्जन्यस्तु स्वर्गादिरुद्देश्यः फलम्ः रावं वमनादिष्वपि कर्माधिकरणाद्युन्त्तयम् ॥

च. सू. 26/13

Cakrapani has given very clear explanation regarding different modalities with an example.

(i) *Karma- Dravyas* used to perform *Shirovirechana Karma* should produce *Shirovirechana Karma.*

(ii) *Virya-* The factor responsible for *Shirovirechana Karma* is *Virya* of it.

(iii) *Adhikarana-* In *Shirovirechana Karma, Adhikarana* is *Shiras.*

(iv) *Kala- Vasantadi Ritus* when the person having *Shirogauravata.*

(v) *Upaya-* Considering the procedure like *Pradhamana* or *Avapidana Nasya* administering the *Aushadha* in proper position.

(vi) *Phala-* After completion of the procedure the desired result, if patient is relieved from heaviness of head then it is called *Phala.*

Further he opines that same method may be used to assess *Vamanadi Karma.*

Modern Concept of Drug Action (Pharmacodynamics)

Pharmakon=drug, dynamics=action or activity is the study of the biochemical & physiological effects of drugs & their mode of action. These effects are achieved by some underlying biochemical and/or physiologic interaction between the drug and a functionally important tissue component (usually a receptor) in the body. Thus, it is important to recognise the following properties of drugs:

General properties of Drugs

1. Drugs do not confer any new functions on a tissue or organ in the body, they only modify existing functions. Therefore, the effects of drugs can be recognised only by alterations of a known physiologic function or process.

   E.g.: Administration of a cathartic (an agent having purgative action) can potentiate the rate of evacuation of the large intestine.
2. Drugs in general exert multiple actions rather than a single effect. Consequently, drugs may in varying degrees produce undesirable responses because of their potential to modify more than one function of the body.
3. Drug action results from a physico-chemical interaction between the drug and a functionally important molecule in the body.

Action-Effect Sequence

'Drug action' and 'Drug effect' are often loosely used interchangeable but are not synonymous.

Drug action- It is the initial combination of the drug with its receptor resulting in a conformational change in the receptor.

Drug effect- It is the ultimate change in biological function brought about as a consequence of drug action.

The type of response produced by the drug is called its effect, but how & where it is produced is called its action. In other words, drug action always precedes the drug effect.

For e.g., Miosis (Contraction of pupil) produced by pilocarpine is its effect, however it results due to parasympathetic stimulation of the circular muscles of iris, hence this is its action.

Drug	**Action**	**Effect**
Pilocarpine -	Parasympathetic stimulation of circular muscles of iris	Miosis

Principles of Drug action

Drugs (except those gene based) do not impart new functions to any system, organ or cell; they only after the pace of ongoing activity. The basic types of drug action can be broadly classed as:

1. Stimulation
2. Depression
3. Irritation
4. Replacement
5. Cytotoxic action

1. **Stimulation-** It is selective enhancement of the level of activity of specialized cells. E.g.: Adrenaline stimulates Heart.
2. **Depression-** It is selective diminution of activity of specialized cells.
   E.g.: Quinidine depresses heart.
3. **Irritation-** This refers to non-selective, often noxious (harmful) effect & is particularly applied to less specialized cells (epithelium, connective tissue). Mild irritation may stimulate associated function. E.g.: Bitters increase salivary & gastric secretion.
4. **Replacement-** This refers to the use of natural metabolites, hormones or their congeners (same kind) in deficiency states.
   E.g.: Insulin in Diabetes mellitus, Iron in Anaemia
5. **Cytotoxic Action-** Selective cytotoxic action for invading parasites/cancer cells, killing them without significantly affecting the host cells.
   E.g.: Penicillin.

Site of Drug Action

Two drugs may exhibit the same effect but their site of action may differ. For example, the site of action of pilocarpine, for producing miosis, is the circular muscle of iris.

However, morphine also produces miosis but its site of action is stimulation of 3rd cranial nerve nucleus.

Drug	Site & Action	Effect
Pilocarpine -	Stimulate circular muscle of iris	Miosis
Morphine -	Stimulate 3rd cranial nerve nucleus	Miosis

The drugs may act at

1. Extracellular 2. Cellular 3. Intracellular site

1. **Extracellular Site of Action-** Action is outside the cell.
   E.g.: Antacids neutralise gastric acidity.
2. **Cellular Site of Action-** Action is on the cell membrane.
   E.g.: Inhibition of membrane bound AT pase by cardiac glycosides.
3. **Intracellular Site of Action-** Action is produced within the cell.
   E.g.: Sulpha drugs act by interfering the synthesis of folic acid (which is an intracellular component).

Mechanisms of Drug Action

Barring a handful of drugs whose actions can be explained on the basis of their simple physical or Chemical properties, majority of drugs act in complex manner-all elements of which are seldom known. The fundamental mechanisms of drug action can be distinguished into four categories.

1. Physical action
2. Chemical action
3. Through enzymes
4. Through receptors

1. **Physical action-** A physical property of the drug is responsible for its action.
   E.g.: Mass of drug - Bulk laxatives.
   Osmotic activity - Magnesium sulphate retains fluid inside lumen of intestine & thus increases faecal bulk.
2. **Chemical Action-** The drug reacts extracellularly according to simple chemical equation.
   E.g.: Antacids neutralize gastric HCl.
3. **Through Enzymes** - Almost all biological reactions are carried out under catalytic influence of enzymes; hence enzymes are a very important target of drug action. Drugs can either increase or decrease the rate of enzymatically mediated reactions.

(i) **Stimulation** - Drugs which stimulate the enzyme & there by influence the rate of reaction.

(ii) **Inhibition** - Inhibition of enzymes is a common mode of drug action. This may be non-specific or specific.

Non-specific Inhibition: Drugs which alter the structure of any enzyme with which they come in contact & inhibit.

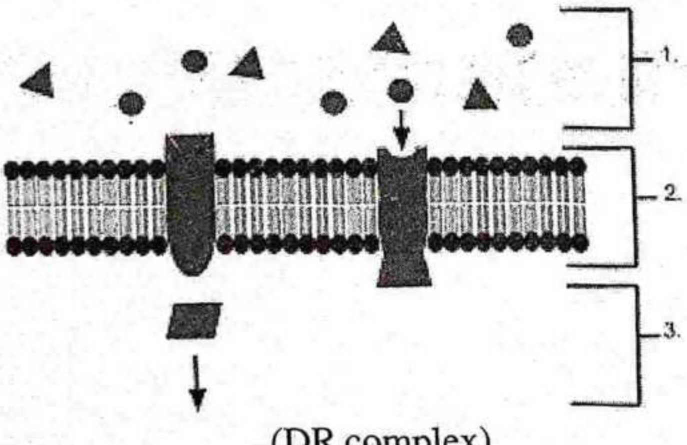
E.g.: Alcohol, Formaldehyde

Specific Inhibition: Drugs inhibit a particular enzyme without affecting others.

4. **Through Receptors** - Most drugs exert their effects, both beneficial & harmful, by interacting with receptors. Receptors are specialized target macromolecules present on the cell surface or intracellularly which binds with specific drugs and mediate their pharmacologic actions.

Binding of a drug with its receptor results in the formation of the drug-receptor complex and leads to a biologic response

Drug + Receptor Drug-Receptor complex - Biologic effect.



(DR complex)

Figure: The recognition of a drug by a receptor triggers a biologic response.

Receptor is defined as a specific binding site with functional correlate (s). Receptors are situated on the surface or inside the effector cell & specific agonists combine with them to initiate the characteristic response. Ligand (Latin=ligare - to bind) It is a molecule which attaches selectively to particular receptors or sites. Here it can be called as Drug.

The overall effect is attributed to the following two factors:

(a) **Affinity:** Which means the capability of a drug to form the complex with its receptor (DR complex)

E.g.: The key entering the key hole of the lock has got an affinity to its levers.

(b) **Efficacy (Intrinsic Activity-IA):** Which means an ability of a drug to trigger the pharmacological response after making the DR complex.

E.g.: If the same key after entering the key hole of the lock opens it too, it has got intrinsic activity also, otherwise only affinity.

On the basis of affinity & efficacy, the drugs can be broadly classified into

1. **Agonist** - It activates a receptor to produce an effect similar to that of the physiological signal molecule. It has both, high affinity & efficacy.
2. **Inverse agonist (negative antagonists)** - It activates a receptor to produce an effect in the opposite direction to that of the well-recognised agonist. It has full affinity but intrinsic activity ranges between zero and -1.
3. **Antagonist** - It prevents the action of an agonist on a receptor or the subsequent response, but does not have any effect of its own. It has only affinity but no intrinsic activity.
4. **Partial agonist** - It activates a receptor to produce submaximal effect but antagonises the action of a full agonist.

These have full affinity to receptor but with low intrinsic activity (IA=O to 1) and hence are only partly effective, as an agonist.

Type	Affinity	Efficacy (IA)	Characteristic
Agonists	Maximum	Maximum IA=1	Activate receptors to produce maximum biologic response
Inverse agonists (Negative antagonists)	Maximum	Submaximal Intrinsic activity IA=O to -1	Activate receptor to produce opposite effect
Antagonist (Competitive antagonist)	Maximum	No intrinsic activity IA=O	Binds to receptor to Prevent the binding of an agonist.
Partial agonist	Maximum	Low intrinsic activity IA=0 to 1	Activates receptor but antagonises the action of a full agonist

Receptor types

These receptors may be divided into 4 families.

1. Ligand-gated ion channels 2. G-protein-coupled receptors

3. Enzyme linked receptors 4. Intracellular receptors.

1. **Ligand-gated ion channels-** These receptors are localised on cell membrane and are coupled directly to an ion channel that are responsible for regulation of

flow of ions across cell membranes. These channels open only when the receptor is occupied by an agonist. The subsequent flow of ions can elicit cellular response.

2. **G-protein coupled receptors-** A second family of receptors consists of G-protein coupled receptors. Comprised of a single peptide that has seven membrane spanning regions, these receptors linked to a G-protein (Gs) having 3 subunits, an ??subunit that binds guanosine triphosphate (GTP) & a ?r subunit. Binding of the appropriate ligand to the extracellular region of the receptor activates the 'G' protein so that GTP replaces guanosine diphosphate (GDP) on the ?-subunit. Dissociation of G-protein occurs & both the ?-GTP subunit & ?r unit subsequently interact with other cellular effectors. These effectors are known as second messengers, because they are responsible for further actions within the cell.

The cellular effectors are two:

(i) Activation of adenyl cyclase- Results in the production of cyclic-adenosine monophosphate (CAMP).

(ii) Activation of phospholipase C- Results in generation of inositol- 1,4,5-triphosphate (IP3) & diacylglycerol.

3. **Enzyme-linked receptors-** A third major family of receptors consists of those that have a cytosolic enzyme activity as an integral part of their structure/ function. Binding of a ligand to an extracellular domain activates or inhibits its cytosolic enzyme activity.

4. **Intracellular receptors**- The receptor is entirely intracellular & therefore the ligand (drug) must diffuse into the cell to interact with receptor.

Binding of the ligand with its receptor leads to activation. The activated ligand-receptor complex migrates to the nucleus, where it binds to specific DNA sequences, resulting in regulation of gene expression.

References

1. Leda M. Mckenry, Evelyn Salerno, ''Pharmacology in Nursing,' 20th edn, Mosby, U.S.A. 1998: 30.
2. K. D. Tripathi, ''Essentials of medical pharmacology 5th edn, Jaypee Brothers, New Delhi, 2003: 33.67.
3. Richard D. Howland, Mary, J. Mycek, ''Lippincott's Illustrated reviews: Pharmacology,'' 3rd edn, Indian edition, Lippincott Williams & Wilkins, Philadelphia, 2006: 25.

4. H.L. Sharma, K.K. Sharma, ''General pharmacology-Basic concepts'', 1st edition, Paras publishing, Hyderabad, 1999: 65.

3. *Dravya Karmukata Vividha Parikshana*

Ayurvedic view

1. *Acharya Caraka* while applying the *Dashavidha Pariksha* to *Cikitsa* says that *Bheshaja* form the *Karana.* He further elaborates the assessment parameters for *Bheshaja.*

करणं पुनर्भेषजम् । भेषजं नाम तद्यदुपकरणायोपकल्पते भिषजो धातु-साम्याभिनिवृत्तौ प्रयतमानस्य विशेषतश्चोपायान्तेभ्यः ।.........यत्तु द्रव्यभूतं तद्वमनादिषु योगमुपैति । तस्यापीयं परीक्षा-इदमेवंप्रकृत्यैवंगुणमेवंप्रभावमस्मिन् देशे जातमस्मिन्नृतवेवं गृहीतमेवं निहितमेवमुपस्कृतमनया च मात्रया युक्तमस्मिन् व्याधावेवंविधस्य पुरुषस्यैवातावन्तं दोषमपकर्षत्युपशमयति वा यदन्यदपि चैवंविधं भेषजं भवेतच्चानेन विशेषेण युक्तमिति ॥ च. वि. 8/87

1. इदं राव प्रकृति - Possess specific characteristics.
2. रावं गुण - Possess respective properties.
3. रावं प्रभाव - Possess specific actions.
4. अस्मिन् देशे जातः - Grown in a specific region.
5. अस्मिन् ऋतु - During a specific season.
6. रावं गृहीतमेवं - Collected at right & specific time.
7. रावं निहितं - Preserved through right mode.
8. रावं उपस्कृतमनया- Processed in a specific method.
9. च मात्रया - To be administered in right dose.
10. युक्तमस्मिन् व्याधावेवं विधस्य पुरुषस्यैवतावन्तं दोषमपकर्षत्युपशामयति वा - If the above is followed, then that *Bheshaja* will have a specific & measured effect on *Dosha* either *Upashamana* or *Apakarshana.*

2. According to Ayurveda, there are three basic mean to acquire knowledge, which can be aptly adopted to assess the drug action.

द्विविधा तु खलु परीक्षा ज्ञानवतां-प्रत्यक्षम्, अनुमानं च । रातद्धि द्वयमुपदेशश्च परीक्षा स्यात् । रावमेषा द्विविधा परीक्षा, त्रिविधा वा सहोपदेशेन । च. वि. 8/83

Pratyaksha, Anumana & Upadesha (Aptoadesha) are the means to acquire knowledge.

Accordingly, the *Dravya Karmukata* can be assessed or examined through these. We understand a Dravya through its *Rasadi Padartha,* hence assessment of these, in turn will help in examination of *Dravya Karmukata.*

(a) *Pratyaksha*- Rasa can be assessed through *Rasanēndriya*.

Certain *Guna* can also be assessed through *Jnanendriya*, like *Snighda, Ruksha, Picchila, Vishada Mradu* etc.

Virya can also be sometimes examined through *Sparshanendriya*.

(b) *Anumana*- *Vipaka* is assessed only after inference, i.e. by observing the actions of a dravya on the body or after observing the drug effect.

In Ayurveda many a times, drug action is assessed after observing its effect only. Hence *Anumana* plays an important role.

(c) *Aptopadesha*- Knowledge obtained from classical literature helps to examine the drug action.

Modern View

Drug Evaluation- The crude drugs can be identified on the basis of their following studies.

(i) Morphological (Organoleptic) (ii) Microscopic

(iii) Chemical (iv) Physical (v) Biological

(i) **Morphological-** It refers to evaluation of drugs by colour, odour, taste, size, shape and special features like touch, texture etc.

(ii) **Microscopic-** It allows more detailed examination of drug and can be used to identify drugs by their histological characters.

(iii) **Chemical-** It comprises of different chemical tests and chemical assays. The isolation, purification & identification of active constituents are chemical method of evaluation.

(iv) **Physical-** Physical standards such as moisture content, viscosity, ash value etc. are determined which help in evaluation.

(v) **Biological-** When drug is evaluated by means of its effect on living organisms like bacteria, fungus or animal tissue or entire animal, it is known as biological evaluation or bioassay. This is otherwise known as Animal experimentation.

Animal experimentation or Experimental pharmacology aims to study the action of existing drugs or new drugs. It is done in two main stages:

(i) **Preclinical Experimental Pharmacology-** Which involves identification of novel chemical lead structures & testing on animals & animal tissues or organs for their biological actions.

(ii) **Clinical Pharmacology-** Where testing of drugs is done on human volunteers & patients for assessing the pharmacokinetics, safety & efficacy in humans.

Note:

Invitro - Study carried in an artificial environment like test tube or culture media.

In vivo - Study carried in the living body or in animals.

4.1 Common Experimental Animals

Common experimental animals used are listed below. Tissues, organs, or the entire animal is used for pharmacological investigations of drugs.

Common experimental animals used are listed below. Tissues, organs, or the entire animal is used for pharmacological investigations of drugs.

Sl. No.	Animal	Weight	Advantages	Commonly used to study
1.	Guinea Pig	600-800g	- Easy to breed & maintain - Sensitive to histamine.	- Local anaesthetics - Bronchodilators - Amoebiasis - Cholera - Antispasmodics
2.	Albino Rat (Wistar Rat)	200-300g	- Resembles man in several organ function & nutrition - Sensitive to most drugs. - Lack vomiting centre.	- Hepatoprotective - Hypoglycaemic - Antifertility
3.	Albino mouse (Swiss white mice)	25-30g	- Easy to breed & maintain. - Smallest lab animals - Sensitive to most drugs.	- Toxicity study - Analgesics - CNS active drugs - Chemotherapeutics
4.	Rabbit	2-3 kg	- Resistant to action of Atropine.	- Pyrogen testing
5.	Frog	150-200g	- Inexpensive - Easily available	- Local anaesthetics (Nerve block)
6.	Cats & Dogs	5-8 kg	- Easy availability	- Blood pressure - Gastric secretory function
7.	Monkeys		- Sub human mammals' closet to man	-Toxicity study

4.2 Experimental Models for Select Activities

References

1. S.K. Kulkarni, ''Hand book of Experimental Pharmacology'' 3rd edn, Vallabh Prakāśan, Delhi 1999: 12.
2. S.K. Gupta (Editor), ''Drug screening methods,'' 1st edn. Jaypee Brothers. New Delhi, 2004.

Advances in drug discovery has led to new screening methods, utilizing various techniques spanning in vitro, in vivo & clinical system. The following table gives a glimpse of few animal experimental models for some common pharmacological activities.

Sl. No	Pharmacological Activity	Experimental Models	Animal
1.	Toxicity study (LD_{50})	**In vivo** Procaine hydrochloride induced acute toxicity	Mice
2.	Anti-ulcer	**In vivo** - Pylorus ligation - Stress ulcer models - Histamine induced	 Rat (wistar) Albino Rat Male guinea pigs
3.	Cardiotonic	- Coronary ligation method - Chronic Rapid Pacing - Volume & Pressure over-load	Rat Dog Rabbit
4.	Antihypertensive	**In Vitro** -Tail cuff method - Chronic Renal Hypertension - Renin Inhibition - Fructose induced hypertension	 Rat Dog Monkey Wistar Rat
5.	Antidepressant	**In Vivo** - Water wheel model - Learned helplessness test - Isolation induced hyperactivity	 Mice Wistar Rat Wistar Rat
6.	Antiepileptics	**In Vitro** - Electrical recording **In Vivo** - Electrically induced Seizures - Chemically induced - Seizures induced by focal lesions	 Isolated Brain Cell Mice/Rat Mice/Rat Monkey
7.	Learning & Memory	**In Vitro** - Study of field excitatory Post Synaptic potentials **In Vivo** - Passive avoidance - Active avoidance - Morris water maze	 Wistar Rat Rat/mice Rat/mice Rat/mice

8.	Anti-obesity	**In Vivo** - Diet induced - Hypothalamic obesity	 Female Rat Female Sprague Rat
9.	Analgesic	**In Vivo** - Haffner's tail clip method - Hot plate method -Tool warm water immersion method - Writhing test	 Male mice Mice Female Wistar Rat Mice
10.	Anti- inflammatory	**In Vitro** -Mast cell degranulation **In Vivo** - Carrageenan-induced paw oedema Model - UV-B- induced erythema - Papaya latex induced arthritis	 Peritoneal Mast Cell Rat /Mice Guinea pigs Rat
11.	Anti-diabetic	**In Vivo** - Alloxan induced Diabetes - Dexamethasone induced Diabetes - Surgically induced Diabetes	 Rabbit/ Wistar Rat Rat Cat/Dog
12.	Antiasthma tic	**In Vitro** - Isolated lung - Isolated perfused lung **In Vivo** - Histamine induced bronch-oconstriction Airway inflammation	 Guinea pig Sprague Rat Guinea pig Mice

5.1 Dipana

पचेन्नामं वन्हिकृच्च दीपनं तद्यथा मिशि । शा. प्र. 4/1

दीपनीयो वन्हेरुद्धीपनाय हितः । गणनाथ सेन् दह च. सू. -4/8

दीपनमन्तरग्रे संधुक्षणं, तस्मै हितं दीपनीयम् । योगरत्नाकर

पचेन्नाम वन्हिकृद्यद्दीपनं तद्यथा मिसिः । भा.प्र. मिश्रकप्रकरण-212

यदग्निकृत् पचेन्नामं दीपनं तद्यथा घृतम् ।। कै. नि. मिश्रक वर्ग-190

तन्त्रान्तरेच दीपनपाचनयोर्लक्षणमुक्तंम् । यथा-यदाग्निकृत्पचेन्नामं दीपनं तद्यथा घृतम् ।

पाचनं सद्विपर्यस्तं यथा वक्ष्यामि लक्षणम् ॥ सर्वाङ्ग सुन्दरि दह अ. हृ. सू. 14/7

That which kindles the *Agni* (digestive fire) but does not digest *ĀAama* is called *Dipana.*

Sharngadhara and *Bhavamishra* give the example of *Mishi (Shatapushpa)* while *Kaiyyadiva* gives *Ghrata.*

Arunadatta gives a cross reference to the definition of *Dipana.*

Paryaya

दीपनं दीपनीयं च वह्निकृद् वह्निवर्द्धनम् । कै. नि. मिश्रक वर्ग-190

Synonyms of *Dipana* are: *Dipana, Dipaniya, Vahnikrat* and *Vahnivardhana.*

Characteristics of *Dipaniya Dravya*

दीपनमग्निगुणभूयिष्ठं तत्समानत्त्वात् । सु. सू. 41/6
उष्णातीक्ष्णसूक्ष्मरूक्षखरलघुविशदं रूपबहुलमीषद्ल्लवण
कटुकरसप्रायं विशेषतः.............................। सु.सू. 41/3
कटुकाम्ल.....लवणान् रसान् तीक्ष्णोष्णालघून्
गुणाश्चाश्रितमिति तदग्निवैव निर्वर्त्यम् । र. वै. पृ-179, भाष्य
पित्तलान् रसान् गुणांश्च दीपनीयम् । तदाग्नेयम् । र. वै. सू. अ-4/10
पृथिव्यनिलबाहुल्याद्दीपनं परिचक्ष्महे । र. वै. अ. 4/30 भाष्य

Nagarjuna says that *Dipana Dravyas* are *Prathivi* & *Agni Mahabhuta* predominant, while *Sushruta* says that *Dipana* is dominant of *Agni Mahabhuta* & hence will resemble the characteristics of *Agneya dravya.*

Thus, the characteristics of *Dipana Dravya* can be summarised as:

Rasa - Amla, Lavana, Katu

Guna - Tikshna, Ushna, Laghu, Sukshma, Khara, Vishada.

Examples: - *Mishi (Shatapushpa) - Anethum sowa* & *Ghrata*

वह्निकृत् वह्निदीप्तिकृत् । ननु यद्वन्हिं प्रदीपयति तदायं कथं न पचेदित्या-शङ्कायामुच्यते, दीपन द्रव्यं तावन्तं वन्हिं प्रदीपयति यद् 'अन्ने भोक्तुमिच्छामुत्पादयन्ति, न त्वामं पक्तुं क्षमम्, यथा-सूक्ष्मदीपाग्निः इद्योतं करोति न तु बृहत्स्थालीस्थान् तण्डुलान् ओदनं कर्तु क्षमः ॥

भाष्य-भा. प्र. मिश्रक-212

There arises a doubt as to why a drug which can kindle digestive fire, is incapable of digesting *Ama.* The answer is that a *dipana dravya* kindles *Agni* to an extent that it only stimulates appetite and is hence incapable of digesting. Just like a small lamp imparts light but fails to cook rise in a vessel.

ननु कथमेतद्गुणयुक्त मिशिर्नामग्री भवति तद्विनाशकत्वेन कथमग्नेः प्रबोधः स्यात् ? । उच्यते-द्रव्याणां प्रभावी विचारणीय इति सुश्रुतः न हेतुभिर्विचार्यते । दीपिका-भाष्य दह शा. प्र-4/1

Adhamalla, the commentator on *Sharangadhara Samhita* raises the same question and says that it is the innate chemical nature of the *Dravya* which helps only to ignite *Agni.*

Appetizers

These are drugs which stimulate appetite. Symptomatically, appetite can often be improved by varying the diet and by use of such simple preparations like lemon pickles, bitters such as bitter orange peel, cardamom & soups.

- Alcohol in small quantities can augment the gastric secretion both reflex by stimulation of taste buds and by a direct action.
- Even insulin, on parental administration, augments gastric secretion by producing hypoglycaemia.

Ref: Satoskar, a Pharmacology & Pharmacotherapeutics'', 18th ed^{n}, Popular Prakashan, Mumbai, 2003, 561.

Clinical Utility: *Dipana Karma* is very much useful in cases of *Agnimandya* (dcreased appetite) and in many diseases where it is associated with *Mandagni* (decreased appetite). Even as a *Purva Karma* for various *Panchakarma* procedures *Dipana Karma* is beneficial.

5.2 Pachana

पचत्यामं न वन्हिं च कुर्याद्यतद्धि पाचनम् । नागकेशरवत्.......................... । शा. प्र. 4/12

यद्धव्यमामं पचति वह्निं न कुर्यात् तत् पाचनं ज्ञेयम् । अत्रापि द्रव्यप्रभावो बोद्धव्यः ।

दीपिका- दह शा. प्र. 4/1-2

यत् आमं पचति वह्निं न कुर्यात् न कुर्यात् तत्पाचनम् । गूडार्थदीपिका दह शा. प्र. 4/1-2

पचन्तमग्निं प्रतिपक्ष क्षपर्णन बलदानेन च यत्- पाचयति तत् पाचनं, तच्च वाय्वाग्निगुण भूयिष्ठम् । चक्र- च. सू-22/8

पाचयतीति पाचनम् । पचतोऽग्नेः पक्तुं शक्तिमधिकां यदुत्पादयति तद्रव्यं क्रिया वा पाचनमुच्यते । यथा, लङ्घनं मुस्तादि वा । सर्वाङ्ग सुन्दरी-अ.हृ.सू. 14/6-7

अग्नेस्तु गुणबाहुल्यान् पाचनं परिचक्ष्महे । र. बै. भाष्य- पृ. 187

That *Dravya* which digests *Ama* but does not stimulate *Agni* is *Pachana.*

Chakrapani comments that which strengthens *Agni* and thus digests *Ama* is *Pachana.* This is *Vayu & Agni bhuta* predominant.

Nagarjuna is of the opinion that *Pachana dravya* are *Agni bhuta* dominant.

Arunadatta says that a dravya or kriya which strengthens the *Agni* and thus digests *Ama* is *Pachana.*

For example: *Kriya - Langhana,*

Dravya - Musta (Cyperus rotundus)

पाचनानीति-आहारान् पचन्तं जाङ्गरमग्निं सन्धुक्षयन्ति तद्बलं वर्धयन्ति च । यानि पाचयन्ति तानि पाचनानि वाय्वग्निगुणबहुलानि सैन्धवमादीनि द्रव्याणि । लौकिकोऽयं च वह्निरपि पाचनः । गङ्गाधर दह च.सू. 22/18

Note: Both *Pachana* & *Dṝipana* are considered to be types of *Shamana.*

समीकरोति विषमान् शमनं तच्च सप्तधा । पाचनं दीपनं क्षुतृड्व्यायामातपमारूताः ॥

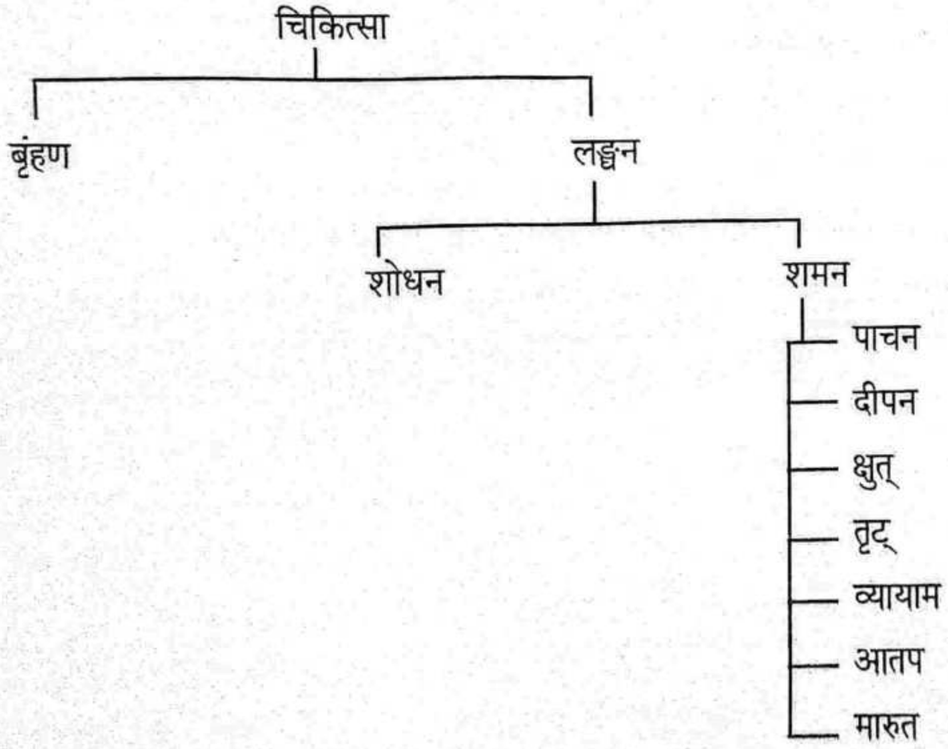
अ. ह. सू. 14/6-7

l*Charaka* considered *Pachana* as a type of *Langhana.*

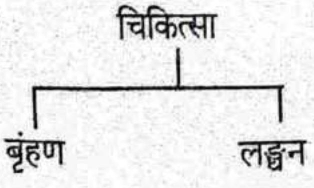
चतुष्प्रकाराः संशुद्धिः पिपासामारुतातपैः । पाचनान्युपवासञ्च व्यायामश्चेति लङ्घनम् ॥

च. सू. 22/18

Ashtanga Hradaya



Caraka Samhita



- 4 types of *Śodhana*
- *Pipāsa*
- *Māruta*
- *ĀAtapa*
- *Pācana*
- *Upavāsa*
- *Vyāyāma*

Clinical Utility: *Pachana Karma* is much beneficial in cases of *Ajirna* (Indigestion). *Pachana* helps in relieving *Ama* (Undigested food) which is responsible for the manifestation of most of the diseases.

Dipana Pachana

चित्रो दीपनपाचनः । शा. प्र. 4/1

That which acts both as a *Dipana* & *Pachana* is called *Dipana Pachana.*

E.g.: *Chitraka* (*Plumbago zeylanica*)

Understanding *Dīpana-Pācana Karma*

A review of gastrointestinal physiology will help to understand these *Karma.*

Gastric secretion:

The stomach mucosa has two important types of tubular glands.

Glands

- Oxyntic (Gastric) (Composed of 3 types of cells)
  - Mucous (Neck) Cells — Mucus, Pepsinogen (Little)
  - Peptic (Chief) Cells — Pepsinogen (Large-amount)
  - Parietal (Oxyntic) Cells — HCl, Intrinsic factor
- Pyloric
  - Mucous Cells — Mucus
  - G Cells — Gastrin (Hormone)

Gastric Secretion & Function

Sl. No.	Content	Secreted by	Function
1.	HCl	Parietal Cells of Oxyntic gland	• Activates pepsinogen to pepsin • Bacteriolytic action • Provides acid medium for action of enzymes
2.	Pepsinogen	Peptic cells of Oxyntic gland	Pepsin (activated pepsinogen) helps in protein digestion.
3.	Mucus	Mucus cells of Pyloric & Oxyntic gland	• Protection of stomach wall
4.	Intrinsic factor	Parietal cells of Oxyntic Cells	• Necessary for Vitamin B12 absorption
5.	Gastric Lipase		• Helps in lipid digestion

Ref: K. Sembulingam & Prema Sembulingum, ''Essential of Medical Physiology,'' nd Edn, Jaypee Brothers, New Delhi 2001, 167-168.

Regulation of Gastric Secretion

Gastric secretion is mainly controlled by following three regulators.

Sl. No.	Regulators	Stimulates	Effect
1.	Acetylcholine (Vagus)	• Neck cells • Peptic cells • Parietal cells • G Cells	• Mucus • Pepsinogen • HCl • Gastrin
2.	Gastrin (Hormone)	• Stimulates histamine production	• HCl
3.	Histamine	• Stimulates parietal cells	• HCl

Activation of Pepsinogen

Inactive pepsinogen is activated by HCl into Pepsin. Pepsin has proteolytic activity (digests protein). It is inactivated at pH5. Hence HCl is important for activation of Pepsinogen & there by in protein digestion.

Pancreatic Secretion

Constituents & their function:

Sl. No.	Content	Secreted by	Function
I	Enzymes 1. Trypsin 2. Chymotrypsin 3. Carboxypoly peptidase 4. Pancreatic amylase 5. Pancreatic lipase 6. Cholesterol esterase 7. Phospholipase	Pancreatic acini	 Protein digestion Protein digestion Protein digestion Carbohydrate digestion Fat digestion Fat digestion Fat digestion
II.	Sodium bicarbonate	Ductules	Neutralize HCl emptied into duodenum
III.	Water	Ductules	

Note:

Proteolytic enzymes when synthesized in pancreatic cells are in inactive forms as trypsinogen, chymotrypsinogen & procarboxy polypeptidase which are activated by enterokinase enzyme secreted by intestinal mucosa.

Inactivated

Proteolytic enzymes (Pancreas) $\xrightarrow[\text{(in intestine)}]{\text{Enterokinase}}$ Active Proteolytic enzymes (Intestine)

Regulation of Pancreatic Secretion

Sl. No.	Regulator	Stimulates	Effect
1.	Acetyl choline	Acinar cells of Pancreas	Produce enzymes
2.	Cholecystokinin in (Hormone secreted by duodenal & upper Jejunal mucosa)	Acinar cells of Pancreas	Produce enzymes
3.	Secretin (Hormone) (Secreted by duodenal & Jejunal mucosa)	Ductol cells of Pancreas	Produce large amount of Sodium Carbonate solution

Secretion of Bile by Liver

Constituents & Functions:

Sl. No.	Content	Functions
1.	Water	
2.	Bile Salts	Emulsify fat, fat absorption
3.	Bilirubin (bile pigment)	Broken down to urobilinogen gives faeces a brown colour
4.	Cholesterol	
5.	Fatty acids	
6.	Bicarbonate	Neutralise the acidic chyme

Note:

- Part of bile secretion is stimulated by 'Secretin'
- Gall bladder emptying is controlled by ''Cholecystokinin''

Small Intestinal Secretion

Secretion from Small intestine is called Succus entericus.

Constituents & Functions:

Sl. No.	Content	Functions
1.	Digestive enzymes • Proteolytic-peptidases dipeptidase • Amylolytic-sucrase, maltase, lactase • Lipolytic-lipase phosphatase	 Splits peptidases to amino acids Splits disaccharides into monosaccharides Splits fat into glycerol & fatty acids
2.	Enterokinase	Activates Trypsinogen to Trypsin
3.	Bicarbonate	Neutralizes acidic chyme
4.	Hormones: • Secretin • Enterogastrone • Cholecystokinin	 Stimulates secretion of bicarbonate from pancreas Inhibits gastric secretion & motility Stimulates gall bladder to expel bile

Requirements for optimal intestinal digestive activity

Although the primary functions of the small intestine are digestion & absorption,

intestinal juice provides little of what is needed to perform these functions.

Most substances required for chemical digestion, bile, digestive enzymes (except for brush border enzymes) & bicarbonate ions are imported from the liver & pancreas.

Hence, anything that impairs liver or pancreatic function or delivery of their juices to the small intestine severely hinders our ability to digest food & absorb nutrients.

Optimal digestive activity also depends on a slow, measured delivery of chyme from stomach.

References

1. Makenna B.R., Collander, ''Illustrated Physiology'', 6th edition, Churchill living stone, NY, 1997: 78-79, 82-90.
2. Bijlani R.L. ''Understanding Medical Physiology'', 3rd edn. Jaypee Brother, New Delhi: 2004: 367.
3. Elaine Marieb, ''Human Anatomy & Physiology'', 6th edn, Addison- Wesley (The Benjamin/cummings publishing company) California, 1998: 806-890.

Points to ponder

- Most of the digestive process occurs in gastrum & duodenum.
- Maximum absorption takes place in Jejunum & ileum.
- Proper digestion depends on appropriate secretion from gastrum, pancreas, liver & small intestine.
- These secretions are regulated by neural & humoral mechanisms.

Hence it can be suggested that

- Drugs which stimulate secretions (either gastric/pancreatic/bile/small intestine) can be considered to possess *Dīpana Karma.*
- Drugs which will aid in the digestive process (activation of enzymes maintains pH environment/motility) can be considered to possess *Pāchana Karma.*
- However, it should be remembered, that clear cut bifurcation between *Dīpana* & *Pācana Karma* is difficult and both co-ordinate most of the time.

Utility of *Dīpana* & *Pācana* in *Cikitsa*

It is a well-established fact that

रोगाः सर्वेऽपि मन्देऽग्नौ सुतरामुदराणि तु । (अ. हृ. नि. 12/1)

Mandāgni is the root cause for all diseases. Hence *Agni* plays a vital role in the management of any disease.

Restoring *Agni* to its normalcy is the prime goal of *Cikitsa* & this can be effectively

brought about by the Judicious and logical use of *Dīpana Pācana Karma* & *Dravyas.*

It would not be wrong, if we say that *Dīpana* and *Pācana* is the first line of treatment for any disease, followed by *Vyādhi Pratyanīka Cikitsa.*

5.3 *Samshodhana*

स्थानाद्बहिर्नयेदूर्ध्वमधो वा मलसंचयम् । देहसंशोधनं तत्स्याद्देवदालीफलं यथा ॥

शा. प्र. -4/8-9/भा. प्र. -6/220

यद्धव्य प्रकुपित स्थानात् मलसञ्चयं दोषादीनां स्वस्थानादूर्ध्वमधो वा बहिर्नयेत् बहिः करोति तद्देहे शरीरे शोधनं कथितम् ।

.........ऊर्ध्वं मुखनासिकाभ्यां अधः पायुर्मेढ्रमार्गेण । देहग्रहणेन शोणितावसेन्वनमपि गृह्यते शोधनत्वात् । यतः शोधनं द्विविधमाचक्षते बहिराश्रयमभ्यन्तराश्रयं च । तत्र बहिराश्रयं शस्त्राक्षाराग्नि प्रलेपादयः । अभ्यन्तराश्रयं तु चतुः प्रकारं वमन रेचनास्थापनशोणितमोक्षणं च । राके शिरोविरेचनं मन्यन्ते । तच्चात्र वमनान्तर्भूतं बोद्धव्यम्, अर्ध्वशोधनत्वात् । दी-आढमल-शा. प्र. 4/8-9

यद्रव्यं स्थानाद्बहिः स्थानान्निरस्य ऊर्ध्वं वा अधः मलसञ्चयं नयेत् तद्देहे संशोधनं स्यात् ।

गू. दी. on शा. प्र. 4/8-9

Drugs which expel the aggravated *Doshas* from the body either from upward or downward direction is known as *Deha Samshodhana* or *Shodhana* or *Samshodhana.*

E.g.: *Devadali (Luffa echinata Roxb.)*

Adamalla, in his commentary refers to two types of *Shodhana* as.

(a) *Bahirashraya shodhana*

(b) *Abhyantarashraya Shodhana*

Purificatory measures undertaken to expel the external impurities (Mala) are known as *Bahirashraya Shodhana.*

E.g.: *Shastra, Kshara, Agni Karma, Pralepa* etc.

Measures, like *Vamana, Virecana, Asthāpana basti, Rakta mokshana, Shiriovirecona* which assist to expel the internal impurities or aggravated *Doshas* is known as *Abhyantarashraya Shoodhana.*

स्थानान्निष्कासानाद् वापि बहिराभ्यन्तराश्रयान् । समेत्य शोधयेत् दोषान् देहसंशोधनं च तत् ॥

कै. नि. मिश्रक वर्ग - 198

Kaiyyadeva Nighantukara also defines *Samshodhana* in a similar manner, that drugs which expel the internal and external *Doshas* from the body.

Thus, *Shodhana* encompasses:

- Expelling internal *Doshas* from either upward or downward direction.
- Expelling internal and external *Doshas* from the body.

यदीरयेद्बहिर्दोषान् पञ्चधा शोधनं च तत् । निरुहो वमनं कायशिरोरेकोऽस्रविस्स्रुतिः ॥

अ. हृ. सू. 14/5

यदौषधं दोषान् वातादीनन्तःस्थितान्, बहिरीरयेत्-क्षिपेत्, तच्छ्रद्धद्द्धनम् ।

स. सु. दह अ. हृ. सू. 14/5

यदीरयेदिति, यद्दोषान् बहिर्निष्कासयेत्तधनम् । आ. र. दह अ. हृ. सू. 14/5

Vagbhata defines as that which expels *Doshas* and proposes 5 types, as *Niruha Basti*, *Vamana*, *Virecana*, *Shiriovirechana* and *Raktamokshana*.

No. of *Shodhana Karma*

वमनं रेचनं नस्यं निरुहश्चानुवासनम् । रातानि पञ्चकर्माणि कथितानि मुनीश्वरैः ॥

शा. उ. 8/63

यदीरयेद्बहिर्दोषान् पञ्चधा शोधनं च तत् । निरुहो वमनं कायशिरोरेकोऽस्त्रविस्त्रुतिः ॥

अ. हृ. सू. 14/5

Sl.No.	*Caraka*	*Sharngadhara*	*Vagbhata*
1.	*Vamana*	*Vamana*	*Vamana*
2.	*Virechana*	*Rechana*	*Rechana*
3.	*Asthapana Basti*	*Niruha*	*Niruha*
4.	*Anuvasana Basti*	*Anuvasana*	*Asruvisrati*
5.	*Shirovirechana*	*Nasya*	*Shirovirechana*

Clinical Utility: *Samshodhana Karma* is commonly used in *Pancha Karma* procedures. As per the requirement in various diseases *Vamana* (Emetic therapy), *Virechana* (Purgation Therapy), *Nasya* (Nasal Instillation), *Asthapana Basti* (Enema) and *Rakta Mokshana* (Blood letting) are adopted.

5.4 *Samshamana*

न शोधयति न द्वेष्टि समान् दोषांस्तथोद्धतान् । समीकरोति विषमान्शमनं तद्यथाऽमृता ॥

शा. प्र. 4/2-3

न शोधयति यद् दोषान् समान्नोदीरत्यपि । समीकरोति च क्रुद्धान् तत् संशमनमुच्यते ॥

कै. नि. मिश्रकवर्ग-193

न शोधयति यद्धोषन्समान्नोदीरयत्यपि । समीकरोति विषमाच्छमनं तद्यथाऽमृता ॥
भा. प्र. 6/214

A *Shamana dravya* has the following characteristics:

(a) It does not expel the vitiated *Doshas.*
(b) It does not aggravate the normal *Dosha.*
(c) It normalises/subdues the aggravated *Dosha.*

E.g.: *Guduchi (Tinospora cordifolia* Miers*)*

न शोधयति यद्धोषान् समान्नोदीरयत्यपि । समीकरोति विषमान् शमनं तच्च सप्तधा ॥

पाचनं दीपनं क्षुत्तृड्व्यायामातप मारुताः ॥ अ. हृ. सू. 14/6-7

Vagbhata gives seven types of *Samshamana.*

(i) *Pachana* (ii) *Dipana* (iii) *Kshut* (iv) *Trat*
(v) *Vyayāma* (vi) *Atapa* (vii) *Maruta*

आकाशगुणभूयिष्ठं संशमनम् । सु. सू. 41/6

संशमनानीति सम्यक् शमयतीति संशमनं, सम्यक्त्वं च दुष्टदोषस्यानिर्हरणपूर्वकं शमनम्, अदुष्टस्यानुदीरणं चः, व्याधिसंशमनं तु प्रस्तुतव्याधेः संशमनमप्रस्तुतव्याधेरनुदीरणम् ।
दी- शा. प्र. 4/2 & डल्हण- on सु. सू. 39/7

संशमनं नाम यद्धोषं दोषग्रहणगृहीतं च व्याधि संशोधनं विना क्षपयति, समं च नोदीरयति ।
चक्रपाणि on सु. सू. 39/7

Sushruta in *Samshodhanasamshamaniya Adhyaya,* i.e. 39th Chapter gives classification of *Dravya* based on *Samshodhana* & *Samshamana.*

The following is a list of examples of *Samshamana dravya.*

Vata Samshamana (Su. Su. 39/7)	*Pitta Samshamana* (Su. Su. 39/8)	*Kapha Samshamana* (Su. Su. 39/9)
Kushtha	Chandana	Shatapushpa
Haridra	Hribera	Langali
Varuna	Ushira	Pippali
Bala	Manjishtha	Karpura
Shatavari	Sariva	Brahati
Badara	Vata	Vacha

Acharya Sushruta considers that *Samshamana Dravyas* are *Akasha bhuta* predominant, while *Rasa Vaisheshika Kara* considers *Vayu, Jala* & *Prthvibhuta.*

Clinical Utility: *Samshamana Karma* is used in managing *Alpa Dosha Vyadhi* (doshas are in mild condition) so as to pacify the aggravated *Doshas* without expelling from the body. After undergoing *Samshodhana* therapy (purificatory measures) if doshas still remaining inside the body *Shamanoushadhis* (medicines having milder actions) are commonly advised.

5.5 *Anulomana*

कृत्वापाकं मलानां यद्भित्वा बन्धमधो नयेत् । तच्चानुलोमनं ज्ञेयं यथा प्रोक्ता हरीतकी ॥

शा. प्र. 4/3-4

Drugs which act on partially formed *Mala* and assist in the formation of well-formed *Mala*, clear the obstruction and thus help in its easy expulsion.

E.g.: *Haritaki (Terminalia chebula* Retz.*)*

यद् द्रव्यं मलानां दोषाणां पाकं कोपशान्तिं कृत्वा, बन्धं विबन्धं च भित्वा भिन्नतां नीत्वा, अधोनयेत् अधः करोति वातादिकम् इति शेषः; तेन प्रतिलोमादनुलोमं करोतीत्यर्थः, तच्चानुलोमनं ज्ञेयम् । अनुलोमनं वातादीनां अधः प्रवर्तनं, सरगुणत्वात्; यथा-हरीतकी । सैवानुलोमनी प्रसिद्धैव । बन्धमिति दोषाणां परस्पर ग्रथिततत्वम्; राके वात-मूत्र-पुरीषादी नामप्रवृत्तिरूपं विवधमाहुः ।

आढमल्ल दह शा. प्र. 4/3-4

यद् द्रव्यमपरिपच्यमानानां मलानां पाकं कृत्वा, बन्ध च भित्वा अधो नयेत् कोष्ठादधः पातयेत् तदनुलोमनं ज्ञेयम् । काशीराम on शा. प्र. 4/3-4

Both *Adamalla* and *Kashirama* commentators of *Sharngadhara Samhita* opine that *Anulomana* act on both *Malapaka* and *Doshapaka. Doshapaka* means mitigation of aggravated *Doshas. Anulomana dravyas* clears the obstruction caused by *Vata, Mutra* & *Pursha.*

सरोऽनुलोमनो प्रोक्तो.............. । सु. सू. 46/522

अनुलोमनी वातमल प्रवर्तनः... । डल्हण on सु. सू. 46/522

Sushruta considered *Anulomana* as a special action brought about by *Sara Guna.*

Even *Dalhana* is of the same opinion when he says that *Anulomana* are *Vatamala Pravartaka.*

Thus, an *Anulomana dravya* has the following effect:

(a) Acts on partially formed *Mala*

(b) Helps in *Mala paka* (formation of well-formed faeces)

(c) Clears obstruction caused due to *Vata, Mutra, Purisha* in GIT (Intestine)

(d) Assists an easy expulsion of formed *Mala.*

Some scholars correlate *Anulomana* to carminatives.

Carminatives

These are the drugs used to expel gas from the stomach or the intestines in the treatment of flatulence and of colic.

Most of these drugs are aromatic volatile oils. They act by mild irritation, thereby increasing the gastrointestinal motility and causing relaxation of sphincters. They produce a feeling of warmth in the stomach. They do not affect the gastric acid secretion significantly. The common ones are Cardamom, Cinnamon bark, Cloves and coriander. (Ref. Satoskar).

Clinical Application: *Anulomana* helps in relieving constipation and hence it is used in *Vibandha* (constipation) and other diseases where Vibandha (constipation) is one of the symptoms.

5.6 *Sramsana*

पक्तव्यं यदपक्त्वैव श्लिष्टं कोष्ठे मलादिकम् । नयत्यधः स्त्रसंनं तद्यथा स्यात् कृतमालकः ॥

शा. प्र. 4/4-5

When the partially processed *Mala* residing in the *Koshtha* is expelled without *Malapaka* (digestion) it is known as *Sramsana.*

E.g.: *Kratamala (Aragwadha - Cassia fistula* Linn.*)*

यद् द्रव्यं मलादिकमपक्त्वैव तेषां पाकमकृत्वैव, अधो नयति अधः पतनं जरोति, तत् स्त्रंसनं स्यात्; यथा-कृतमालकः कीदृशं मलादिकमित्याह-पक्तव्यमिति ।....पच्यमानम् अत राव कोष्ठे श्लिष्टम् । कोष्ठे इति पाचकस्थाने । श्लिष्टमिति आश्रितम् । आढ़मल्ल दह शा. स. प्र. 4/4-5

When partially and completely digested *Mala* is expelled then it is called *Sramsana.*

अविधायैव यत्पाकं सविबन्धं मलं तथा । स्थितं नयत्यधस्तात्तत् स्त्रंसनं परिकीर्तितम् ॥

कै. नि. मिश्रकवर्ग/194

Even *Kaiyyadeva Nighantukara* also opines that if undigested food even though obstructed will be expelled in *Sramsana Karma.*

स्रंसन शब्दो विरेचन सामान्येऽपि प्रयुज्यते यथा- ' 'पित्तं वा कफपित्तं वा पित्ताशयगतं हरेत् । संस्रन'' । च. चि. 3/171

Caraka considered it as *Virechana* and says *Sramsana* is one which subside pitta or *Kapha pitta* or *Pittashayagata Dosha.*

स्त्रंसनं विरेचन् । योगेन्द्रनाथ सेन् दह च. चि. 3/171

Yogendranath sen has considered *Sramsana* as synonym of *Virechana.*

Clinical application: *Sramsana karma* is adopted in cases of *Twak Vikara* (skin diseases) and Vibandha (constipation) where laxative action is required.

5.7 *Bhedana*

मलादिकमबद्धं च बद्धं वा पिण्डितं मलैः । भित्त्वाऽधः पातयति तद्भेदनं कटुको यथा ॥

शा. प्र. 4/5-6

That which expels *Abaddha* (liquid) *Pursha & dosha* or Baddha *Shushka purisha, Baddha ghrathita Dosha* in the downward direction is called *Bhedana.*

E.g.: *Katuki (Picrorrhiza kurroa* Royle ex Benth*)*

यन्मलादिकमबद्धं मलैर्दोषैश्च कृत्वा पिण्डित परिपाकात् पिण्डीभूतं बद्धं, ईदृशं, मलादिकं भित्वा स्थानात् संचाल्य, अधः पातयति, तद्भेदन, 'जातव्यम्' इति शेषः । यथा-कटुकी । बद्धं विबद्धं शुष्कं, ग्रथितं च । तत्र शुष्कं पुरीष विषयं, ग्रथितं दोषादिविषयम् । तदा अबद्धं द्रव्यरूपमपि द्विविधम्-रावं पुरीषविषयम्, अन्यन्मलादिकमिति । मलोऽत्र दोषः आदिग्रहणात् रुक्षदूषिता-(तकता) दीनामपि ग्रहणम् । भित्वेति तत् पुरीषं भित्व विदार्याधः पातयति द्रव्यम् इति शेषः ।

आढ़मल्ल on शा. प्र. 4/5-6

यद् द्रव्यमबद्धं मलादिकं पिण्डीभूतैर्मलैर्बद्ध वा भित्वा विदार्य, अधः पातयति तद् भेदनम् ।

काशीराम on शा. प्र. 4/5-6

Commentators of *Sharangadhara Samhita* also opine in similar way that *Baddha* and *Abaddha mala* will be expelled through *Adhomarga* is called *Bhedana*.

भेदनीयो भेदनाय शरीरान्मलदोषनिर्हरणाय हितः । गंङ्गाधर on च. सू. 4/9

Bhedana is one which breaks down the *Doshas* accumulated inside the body and expels the *Mala* downward.

भेदनं पिण्डित मलानां द्रवीकृत्य बहिःसारणं, तस्मै हितम् । योगेन्द्रनाथ सेन् च. सू. 4/9

Only Yogendranath Sen opines that *Bhedana* dravya liquifies the *Pinditamala* and expels it out.

विबद्धं अविबद्धं वा पिण्डीभूतं मलादिकम् । भित्वाऽधः पातयाति यत्तद् भेदनमुदाहृतम् ॥

कै. नि. मि. 195

That which expels *Baddha, Abaddha* and *Pindibhuta mala* in downward direction is called as *Bhedana.*

अन्तःपूयेष्ववक्रेषु तथैवदेमङ्गवत्स्वपि । गतिमत्सु च रोगेषु भेदनं प्राप्तमुच्यते ॥

सु. चि. 1/34

Sushruta considers *Bhēdana* among *Shashti Upakrama* and indicates in *Antapuya, Utsangi* etc. diseases.

सुवहार्कोह्वबकाग्निमुखी चित्रा चित्रक चिरबिल्व शङ्खिनी शकुलादनी स्वर्णक्षीरिण्य इति दशेमानि भेदनीयानि भवन्ति । च. सू. 4/9

Ten drugs of *Bhedanya Varga* mentioned by *Charaka* are:

(i) *Suvaha - Operculina turpethum*

(ii) *Arka- Calotropis procera*

(iii) *Urubaka (Eranda) - Ricinus communis*

(iv) *Agnimukhi (Langali) - Gloriosa superba*

(v) *Chitra - Baliospermum montanum*

(vi) *Chitraka - Plumbago zeylanica*

vii) *Chirabilva - Holoptelia integrifolia*

(viii) *Shankhini - Euphorbia dracanculoides*

(ix) *Shakuladani- Picrorrhiza kurroa*

(x) *Swarrnakshiri - Euphorbia thomsoniana / Argemone mexicana*

Clinical application: *Bhedana Karma* is beneficial in cases of *Vibandha* (constipation) where the person passes hardened stool.

5.8 *Rechana*

विपक्वं यदपक्वं वा मलादि द्रवतां नयेत् । रेचयत्यपि तज्ज्ञेयं रेचनं त्रिवृता यथा ॥

शा. प्र. 4/6-7

That which liquifies the *Pakwa* and *Apakwa mala (Purisha & Dosha)* and expels out of the body is *Recana.*

E.g.: *Trivrit* (*Operculina turpathum* Linn.)

यद् द्रव्यं विपक्वमपक्वं वा, मलादि दोषादिकं, द्रवतां नयेत् द्रवाभावं करोतीत्यर्थः, न केवलं द्रवतां नयेत् रेचयत्यपि च, तद्रेचनं ज्ञेयं; यथा-त्रिवृता । मलादिकमिति आदिग्रहणात् दूष्यादीनामत्र संग्रहः । आढ़मल्ल दह शा. प्र. 4/6-7

Adamalla is also of the same opinion.

तत्र विरेचनद्रव्याणि पृथिव्यम्बुगुण भूयिष्ठानि, प्रथिव्यापोगुर्व्यः, ता गुरुत्वादधो गच्छन्ति, तस्माद्विरेचनमधोगुणभूयिष्ठामनुमानात् । सु. सू. 41/6

Sushruta says that *Virechana dravya* are *Prathvi* & Ap *Mahabhuta* predominant & since these are heavy in nature, they have a downward movement. It is thus inferred that *Virechana dravyas* facilitate downward movement.

दोषहरणमधोभागं विरेचन संज्ञकम् । च. क. 1/4

अधोगुदेन दोषनिर्हरणं भजत इत्यधोभागम् । च. द. on च. क. 1/4

Charaka also says that expelling *Doshas* from downward direction is known as *Virechana*. He further explains the mechanism of drug action as follows.

तत्रोष्ण-तीक्ष्ण-सूक्ष्म-व्यवायि-विकाशीन्यौषधानि स्ववीर्येण हृदयमुपेत्य धमनीरनुसृत्य स्थूलाणुस्रोतोभ्यः केवलं शरीरगतं दोषसंघातमाग्नेयत्वात् विष्यन्दयन्ति, तैक्ष्ण्याद् विच्छिन्दन्ति, स विच्छिन्नः परिप्लवन् स्नेहभाविते काये स्नेहाक्त भाजन स्थमिव क्षौद्रमसज्जन्नणु प्रवणभावादामाशयमागम्योदान प्रणुन्नोऽग्नि.........सलिल पृथिव्यात्मकत्वादधो भागप्रभावाच्चौषधस्याध प्रवर्तते । च. क. 1/5

Virecana dravyas are having following properties: *Ushna, Tikshna, Sukshma, Vyavayi & Vikasi.*

These *dravyas* by means of their potency reach the heart through the blood vessels. Due to *Sukshma, Vyavayi guna,* these *dravya* spread throughout the minute channels in the body. By virtue of its *Agni Guna & Tikshna Guna* it breaks & liquifies the *Dosha Sanghata,* which reaches the *Amashaya.* As *Virechana Dravyas* are *Prithvi* and *Jala* predominant, these liquefied *dosha* are expelled in the downward direction.

विरेचनं पित्तहराणाम्..................

त्रिवृत् सुखविरेचनानां, चतुरङ्गुलो मृदुविरेचनानां, स्नुक्पयस्तीक्ष्ण विरेचनानाम्........... ।

च. सू. 25/40

Charaka while explaining *Agradravya* says that *Virechana* is best *Pittahara* and continues to classify *Virechana* based on its intensity as:

(a) ***Sukha Virechana*** -*Trivrat (Operculina turpathum* Linn.*)* is the best
(b) ***Mradu Virechana*** - *Aragwadha (Cassia fistula* Linn.*)* best *Mradu Rechaka.*
(c) ***Tikshna Virechana*** - *Snuhikshira (Euphorbia nerifolia* Linn.*)* best *Tikshna Virechaka.*

तथाऽनुलोमनीयम् तत् । पार्थिवमाप्यं च । र. वै. 4/4

Rasa Vaisheshika kara gives same opinion as like that of *Sushruta.*

Comparison of *Anulomana, Sramsana, Bhedana & Rechana:*

Parameter	*Anulomana*	*Sramsana*	*Bhedana*	*Rechana*
Gati (Movement)	*Adho*	*Adho*	*Adho*	*Adho*
Helps in evacuation of *Mala*	Yes	Yes	Yes	Yes
Nature of *Mala* (Acts on)	*Apakwa Mala*	*Paktavya Mala*	*Baddha* or *Abaddha Mala*	*Pakwa* or *Apakwa Mala*
Effect on *Mala*	*Malapaka*	No *Malapaka*	*Bhedana*	*Dravata*
Additional task	Relieves *Adhobandha*	-	-	-

Anulomana

- Effect on *Samana Vayu* (Rectifies the *Pachana, Vivechana* and *Murchana* action of *Samana Vayu*).
- Thus, indirectly stimulates digestion.
- Helps in relieving *Adhobandhana.*

Sramsana

- Effect on last part of small intestine and large intestine's motility.
- Thus, expels without any absorption.
- May also affect the flow of bile (as choleretic)

Bhedana

- Main effect is on large intestine
- Increases intestinal Motility.

Rechana

- Main effect is on large intestine.
- Increases intestinal secretion & Motility.
- Thus, expels loose stools.

Clinical application: *Rechana Karma* is strong when compared to remaining types of *Virechana Karma*. Where the person needs stronger purgative action there *Rechana Karma* can be advised. *Virechana Karma* is commonly used in Twak Vikara (skin diseases), Medoroga (obesity) etc.

Understanding *Anulomana, Rechana, Bhedana & Sramsana*

A brief review of intestinal physiology will help to understand these *Karmas*:

Secretions of large intestine

Great amount of secretion in the large intestine is mucus. The mucus contains large amounts of bicarbonate ions. On irritation, the mucosa also secretes large quantities of water & electrolytes.

Absorption in the large intestine

Approximately 1500 ml of chyme pass through the ileocecal valve in to the large intestine each day. Most of the water & electrolytes in this are absorbed in the colon, usually leaving less than 100 ml of fluid to be excreted in the faeces.

The mucosa has capability for active absorption of sodium. It absorbs chloride ions in exchange transport of bicarbonate ions. The absorption of sodium and chloride ions creates an osmotic gradient across the mucosa, which in turn causes absorption of water.

Digestion in the large intestine

A small amount of digestion by enteric bacteria leads to production of Vitamin K, B12 which are absorbed. No further breakdown occurs in large intestine.

Primary function of large intestine

1. Absorb remnant electrolyte (Na+, Cl-) water.
2. Absorb Vit K, B12
3. Secrete bicarbonate ion
4. Propulsion of faecal matter and defecation.

Motility of Large Intestine

(i) The most frequent movements seen in the colon are haustral contractions, which are slow segmenting movements that occur every 30 minutes.

(ii) Mass movements are long, slow-morning but powerful contractile waves that move over large areas of the colon three/four times daily & force the contents toward the rectum.

Defecation

The rectum is usually empty, but when faeces are forced into it by mass movements, stretching of the rectal wall initiates the defecation reflex. This is a spinal cord-mediated parasympathetic reflex that causes the walls of the sigmoid colon & the rectum to contract & the anal sphincters to relax.

Factors affecting faecal movement in colon

1. **Water-** Minimum amount of water in faeces is required to maintain the stool in soft consistency & thus enable it to pass smoothly through the colon.
2. **Mucus-** It provides the adherent medium for holding faecal matter together.
3. **Bulk (Fibres) -** Fibres in the diet increases the strength of colon contractions and softens the stool, allowing the colon to act like a well-oiled machine.
4. **GI Movement-** Mass movements that move over large areas of colon force the contents towards the rectum.
5. **Secretion-** Intestinal mucosa secretes large quantities of water & electrolytes when irritated, which causes rapid movements of faeces.
6. **Absorption-** Appropriate absorption of water in sufficient time keeps the stool soft. Over absorption of water due to prolonged duration of matter in colon, leads to hard stool which is difficult to pass.

Modern Perspective of Laxatives

Laxatives are drugs that promote evacuation of bowels. A distinction is sometimes made according to the intensity of action.

(a) **Laxative or Aperient-** Milder action, elimination of soft but formed stools.

(b) **Purgative or Cathartic-** Stronger action resulting in more fluid evacuation.

Many drugs in low doses act as laxative & in large doses as purgatives.

Mechanism of Action

All purgative increases the water content of faeces by-

(a) An osmotic action, retaining water & electrolytes in the intestinal lumen, thus increase the volume of colonic content & make it easily propelled.

(b) Acting on intestinal mucosa to decrease net absorption of water & electrolytes; intestinal transit is enhanced indirectly by the fluid bulk.

(c) Increasing propulsive activity as primary action allowing less time for absorption of salt and water as a secondary effect.

(d) Stimulate crypt cells, thus increase water & electrolyte secretion.

Classification

These drugs are sometimes classified according to the intensity of action as mild, moderate or drastic.

Laxatives can be classified according to their mechanism of action as follows:

(i) Bulk forming laxatives

(ii) Stool softener or Emollient laxatives

(iii) Stimulant purgatives

(iv) Osmotic laxatives (Saline laxatives)

Sl. No	Type	Mode of action	Example
1.	Bulk	These laxatives are not absorbed & increase the indigestible residue. These absorb water & swell up, thus providing the stimulus of mechanical distension for evacuation.	• Isapgol (*Plantago ovata*) • Sabza (*Ocimum basillicum*)
2.	Emollient	These laxatives are not significantly absorbed and exert a softening & lubricating effect on faeces.	• Liquid Paraffin • Docusates
3.	Stimulant	These are powerful purgatives which act by altering absorptive & secretory activity of mucosa & thus accumulate water & electrolytes in the lumen (colon). They also inc-	• Anthraquinones Senna (*Cassia angustifolia*) • Fixed irritant oil Castor oil.

		rease motility by acting on Mesenteric plexuses.	
4.	Osmotic	Solutes (salts) that are not absorbed in the intestine retain water osmotically & distend the bowel, thus help in easy evacuation.	• Magnesium sulfate (Epsonsalt) • Sodium potassium Tartarate (Rochelle salt)

Sl. No.	Type	Act on	Time Taken	Nature of Stool	Side Effect	Action
1.	Osmotic (Saline)	Small & large intestine	1-3 hrs	Watery	Little griping pain	Drastic
2.	Stimulant (Castor oil)	Small intestine	2-3 hrs	Copious liquid (Semi fluid)	Griping pain	Drastic
3.	Stimulant (Anthroquinones)	Large intestine	6-8 hrs	Semi solid	Little griping	Moderate
4.	Bulk	Large intestine	12-36 hrs	Solid & Semi solid	No griping	Mild
5	Emollient	Large intestine	1.3 days	Soft	No griping	Mild

Castor Oil

Castor oil, oil obtained from the seeds of Ricinus communis contains triglyceride of Ricinoleic acid. It is hydrolysed in the ileum by lipase to Ricinoleic acid & Glycerol.

Ricinoleic acid is poorly absorbed. It decreases intestinal absorption of water, electrolytes & enhances secretion. Peristalsis is increased secondly.

***Cassia angustifolia* Vahl. (Senna)**

Senna, dried leaves obtained from *Cassia angustifolia* Vahl. The glycosides are not active as such, unabsorbed in the small intestine, they are passed to the colon, where bacteria liberate the active anthrol form, which either acts locally or is absorbed into circulation-excreted in bile to act on small intestine. They act on the mesenteric plexus to increase peristalsis & decrease segmentation. They also inhibit salt & water absorption in the colon.

5.9 *Chedana*

श्लिष्टान् कफादिकान् दोषानुन्मूलयति यद्बलात् । छेदनं तद्यथा क्षारा मरिचानि शिलाजतु ॥

(भा. प्र. 6/223 शा. प्र. ख. 4/9)

Drugs when forcefully disunites the adhered *'Kaphadi Doshas'* from the *Srotas* (or body) is called *Chedana.*

Chedana dravyas should necessarily fulfil the following characters:

(i) *Shlishtan Kaphadi Doshan*- Act on adhered *Doshas.*

(ii) *Vishleshayati Kaphadi Doshan*- Separates/Disunites adhered *Doshas.*

(iii) *Unmulayati Anu*- Eradicates or uproots quickly out of the body.

(iv) *Unmulayati Balat*- Up roots forcefully out of the body.

E.g.: *Kshara, Maricha (Piper nigrum) & Shilajatu*

विश्लेषयति यद् दोषान् संहतास्तु कफादिकान् । पश्चादुन्मूलयत्याशु विज्ञेयं तद्धि छेदनम् ॥
संग्रहस्य विभागं यद् विधायोन्मूलने क्षमम् । भवत्याशु तदप्याहुश्छेदनं क्षारवत् बुधाः ॥
कै. नि. मिश्रकवर्ग 199-200

Kaiyyadeva considers *Chedana Karma* to occur in two stages, the first which involves *Vishleshana i.e.* Separation or disunion of adhered *Dosha,* the second stage is *Unmulana* i.e. eradicate or uproot the separated *Doshas* out of the body.

यद्रव्यं शिलष्टान् सञ्चितान् परस्परग्रथितानित्येके, अत्यर्थं कुपितानित्यापरे, कफादिकान् दोषान्, आदिग्रहणेन वातपित्तशोणित कृमिग्रहणं व तु दूष्यदूष्यातादिकं, यतः दोषानिति पुनर्ग्रहणं कृमिशोणितयोरपि दोषसंज्ञा ।.........। बलादिति स्वशक्तितः उन्मूलयति उच्छेदयति, तच्छेदनं ज्ञेयम् ।
(आ. on शा.प्र. 4/9-10)

यद्धव्यं शिलष्टान् लग्नान् मलादिकान्दोषान् बलादुन्मूलयति स्वभावान्नाशयति तच्छेदनं ज्ञेयम् । यथा क्षार मरिचानि शिलाजतु । गू. शा. प्र. 4/9-10

Adamalla comments that by the term *'Kaphadi dosha'* one has to consider *Vatapitta Shoshita & Krami* not *Dushya.*

अपाकेषु तु रोगेषु कङ्गिनेषु स्थिरेषु च । स्नायुकोथादिषु तथा च्छेदनं प्राप्तमुच्यते ॥
सु. चि. 1/33-34

Sushruta considers *Chedana Karma* among *Shashti upakrama.*

हिङ्गुनिर्यासच्छेदनीय-दीपनीयानुलोमिक-वातश्लेष्महराणाम् ॥ च. सू. 25/40

In *Agradravya adhyaya, Charaka* says *Hingu Niryasa* is best *Chedaniya dravya.*

Clinical application: *Chedana Karma* is considered as strong action in whichever conditions the Doshas which are adhered to *Srotas* and to disunite *Kaphadi doshas* it can be used.

5.10 *Lekhana*

धातून्मलान्वा देहस्य विशोष्योल्लेखयेच्च यत् । लेखनं तद्यथा क्षौद्रं नीरमुष्णं वचा यवाः ॥
शा. प्र. 4/10, भा. प्र. 6/226

विशोष्योल्लिख्य यद् द्रव्यमपवृष्य शनैः शनैः । दोषानुन्मूलयत्येवं लेखनं तद्यथा वचा ॥
कै. नि. मिश्रकवर्ग-201

That which dries up *Dhatu* & *Mala* and scrapes resulting in a lean body is called *Lekhana.*

E.g.: *Kshaudra, Ushnajala, Vacha (Acorus calamus* Linn.*), Yava (Hordeum vulgare).*

Thus, *Lekhana dravya* will impart the following effect.

- Dries up and scrapes *Dhatu,* especially of *Kapha* & *Medas.*
- Dries up & scrapes *Mala.*
- Dries up & scrapes *Deha,* resulting in a lean body.

लेखनमनिलानलगुणभूयिष्ठम् । सु. सू. 41/7

लेखनं कफमेदसोः । डल्हण सु. सू. 41/6

लेखनं पत्तलींकरणः । डल्हण सु. सू. 46/519

Sushruta says *Lēkhana dravya* is *Vayu* and *Teja bhuta* predominant.

Dalhana comments that *Lekhana dravya* it mainly acts on *Kapha dosha* and *Meda dhatu,* and further says that it results in lean body.

लेखनो खरः । हेमाद्रि on अ. हृ. सू. 1/18

Hemadri opines that *Lekhana* is one of the *Karma* of *Khara guna* or a *Khara dravya* results in *Lekhana Karma.*

कठिनात् स्थूलवृत्तौष्ठान् दीर्यमाणान् पुनः पुनः । कठिनोत्सन्नमांसां श्च लेखनेनाचरेत् भिषक् ।
समं लिखेत् सुलिखितं लिखेन्निरवशेषतः । वर्त्मनां तु प्रमाणेन समं शस्त्रेण निर्लिखेत् ॥
सु. चि. 1/38-39

क्षौमं प्लोतं पिचुं फेनं यावशूकं ससैन्धवम् । कर्कशानि च पत्राणि लेखनार्थं प्रदापयेत् ॥
(सु. चि. 1/40)

In the context of *Shalya tantra, Lekhana* is one among *Shashti Upakrama.* It is a procedure to scrape *Vrana.* In case of *Vartma, Lekhana* is done with *Shastra. Dravyas* utilised for *Lekhana upakrama* are *Kshauma (Atasivastram), Plota,* Pichu *(Karpasatulam), Yavashuka (Yavakshara), Phena (Samu-draphena), Saindhava* and *Karkasha patra.*

लेखनीयो देहघर्षणेनेषद्विदारणाय देहद्यर्षणाय लेखनाय हितः । गणनाथसेन् दह च. सू. 4/8

यद्रव्यं देहस्थान् धातुन्मलाविशोष्य शुष्कं कृत्वा लेखयेत् स्थूलस्य कृशादि कारयेत् तल्लेखनम् ।
गूडार्थ दीपिका-शा. प्र. 4/10

Lekhana is one which scrapes unwanted tissue there by making a person lean.

Lekhaniya Varga of *Charaka*

मुस्तकुष्ठहरिद्रादारुहरिद्रा वचाऽतिविषाकटुरोहिणीचित्रकचिरबिल्व हैमवत्य इति दशेमानि लेखनीयानि भवन्ति । च. सू. 4/8

10 drugs having *Lekhana Karma* as mentioned by *Caraka*

(i) *Musta* (ii) *Kushtha*
(iii) *Haridra* (iv) *Daruharidra*
(v) *Vacha* (vi) *Ativisha*
(vii) *Katurohini* (viii) *Chitraka*
(ix) *Cirabilva* (x) *Haimavati*

Clinical application: *Lekhana Karma* is beneficial in *Medo Roga* (diseases due to excessive fat) or *Sthoulya* (obesity) where the excessive *Meda Dhatu* (fatty tissue) has to be reduced.

Difference between *Lekhana & Chedana*

Sl. No.	Aspect	Lekhana	Chhedana
1.	Meaning	Scraping	Cutting/Tearing
2.	Site of action	*Dosha* (especially kapha) *Dhatu* (esp. *Meda*) *Mala*	*Kaphadi Dosha*, (*Vata*, *Pitta*, *Kapha*, *Shonita*, *Krami* & *Mala*) *Shlishta Dosha* (*Adhered Dosha*)
3.	Mechanism of action	(i) *Vishoshana*-First it dries up. (ii) *Lekhayet*-later it scrapes	(i) *Vishleshayati*-Disunites the adherent *doṣa*. (ii) *Unmulayati* Balat-detaches forcefully.
4.	Time taken for action	शनै शनै दोषानुन्मूलयति Removes *doṣās* in parts slowly	उन्मूलयति आशु Removes/uproots *doshas* quickly
5.	Example	*Kshoudra, Ushnajala*	*Kshira, Shilajatu*

5.11 *Grahi*

दीपनं पाचनं यत्स्यादुष्णत्वाद्रवशोषकम् । ग्राहि तच्च यथा शुण्ठी जीरक गजपिप्पली ॥
शा. प्र. 4/11-12

पुरीष संग्रहणं पुरीषस्य स्तम्भनं, तस्मै हितम् । गणनाथ सेन्

A dravya which is both *Dipana pachana* and dries up moisture by virtue of *Ushna Guna* is said to be *Grahi.*

Example: *Shunthi (Zingiber officinale* Roscoe*), Jiraka (Cuminum cyminum* Linn.*), Gajapippali (Cavya Phala - Piper chaba* Hunter*)*

संग्राहिकमनिलगुण भूयिष्ठम्, अनिलस्य शोषणात्मकत्वात् । सु. सू. 41/6

Susruta says that *Grahi dravyas* are *Vayu Mahabhuta* predominent, whereas *Sharangadhara* opines *dravashoshana* is brought about by *Ushna guna.*

To clear this difference of opinion, Adhamalla comments thus,

ननु संग्राहकमनिलगुण भूयिष्ठं यतोऽनिलस्य शोषणात्मकत्वात् । तत्कथमुक्त-मुष्णत्वादिति उच्यते, पक्वामग्राहकत्वेन द्विविधं हि संग्राहकत्वं तत्र यद् ग्रहण्यमामं सम्पाच्य वन्हिं कृत्वा तत्रस्थं द्रवं च शोषयित्वा स्तम्भनं करोति तदुष्णग्राहकं ज्ञेयम् । यद् द्रव्यमतीसारादौ पक्वमलादिकं संस्तभ्य संग्रहं करोति तच्छीतग्राहकं ज्ञेयमेतदनिलगुणभूयिष्ठमित्यदोषः । आढ़मल्ल on शा. प्र. 4/11-12

Adhamalla says that *Grahi* are of two types as-

1. *Pakwagrahi (Shitasangrahi* or *Stambhana)*
2. *Amagrahi (Ushna Sangrahi* or *Grahi)*

When the *Mala* is *'Apakwa'* i.e in *ĀAma mala,* primary requisite is to digest *Ama* and hence should be *Dipana, Pachana* and later it does *Drava Shoshana* with the help of *Ushna guna.* Hence this type of *Sangrahi* is called as *Ushna Sangrahi* or *Grahi.*

Whereas, if the condition is *Pakwa mala* where digestion is not required then *Drava Shoshana* is accomplished by *Vayu* and hence this is called as *Shita Sangrahi* or as *Stambhana.*

Type	Nature of *Mala*	*Drava Shoshana*	Example
Ushna Sangrahi (Grahi)	*Ama*	*Ushna guna*	*Shunthi*
Shita Sangrahi (Stambhana)	*Pakwa*	*Vayu (Ruksha)*	*Tuntuka (Shyonaka)*

Clinical application: *Grahi Karma* is beneficial where the patient passes *Apakwa Mala* (undigested food) owing to its *Dipana* and *Pachana Karma* it helps in proper digestion.

5.12 *Stambhana*

रौक्ष्याच्छैत्यात् कषायत्वाल्लघुपाकाच्च यद्भवेत् । वातकृत् स्तम्भनं तत् स्याद्यथा वत्सक टुण्टुकौ ॥ शा. प्र. 4/12

स्तम्भनं स्तम्भयति यद् गतिमन्तं चलं ध्रुवम् । शीतमन्दमृदुश्लक्ष्णं रुक्षं सूक्ष्मं द्रवं स्थिरम् ॥
यद् द्रव्यं लघु चोद्दिष्टं प्रायस्तत् स्तम्भनं स्मृतम् ॥ च. सू. 22/11-12

A drug which stops or obstructs the motility or movement is called *Stambhana.*

It could stop the movement of fluids that are eliminated from the body like *Vamana, Atisara* or it could stop the movements of internal fluids like *Rakta* and *Pitta.*

Dravyas which have the properties of *Shita, Manda, Mradu, Shlakshna, Ruksha, Sukshma, Drava, Sthira, Laghu* are *Stambhana dravyas.*

...वात वृद्धित्यनेन कोष्ठवायोर्विषृम्भकं, तस्मात् तद् द्रव्यं स्तम्भनं भवतीत्यर्थः ।

आढ़मल्ल on शा. प्र. 4/12

Dravyas by Virtue of *Vata Vraddhikara Gunas* like *Ruksha* & *Laghu* produce *Stambhana.*

E.g.: (i) *Vatsaka (Kutaja - Holarrhena antidysenterica* Wall.*)*

(ii) *Tuntuka (Shyonaka)*

Hence, a *Grahi dravya* should have the following characters.

(i) *Dipana-* Should increase or stimulate *Agni.*

(ii) *Pachana-* Should digests *Ama*

(iii) *Drava Shoshana-* Dries up moisture by *Virtue* of *Ushna guna*

Charaka has mentioned *Purisha Sangrahaniya Mahakashaya Varga* which includes 10 drugs.

प्रियङ्ग्वनन्ताम्रास्थिकटवङ्गलोध्रमोचरससमङ्गाधातकीपुष्पपद्मापद्मकेशराणीति दशेमानि पुरीषसंग्रहणीयानि भवन्ति । च. सू. 4/15

(i) *Priyangu - Callicarpa macrophylla*

(ii) *Ananta - Hemidesmus indicus*

(iii) *Amrasthi - Mangifera indica (Seed Coat)*

(iv) *Katvanga - Oroxylum indicum*

(v) *Lodhra- Symplocos racemosa*

(vi) *Mocharasa - Salmalia malabarica (Resin)*

(vii) *Samanga - Mimosa pudica*

(viii) *Dhatakipushpa - Woodfordia floribunda*

(ix) *Padma* - *Clerodendron serratum*

(x) *Padmakeshara* - *Nelumbo nucifera*

संग्राहिकं विजानीयात् पृथिव्यनिल सम्भवम् ।

लवणतीक्ष्णोष्णेश्योऽन्यत् संग्राहिकं, तत् पार्थिव-वायव्यम् । र. वै. 4

Rasa Vaisheshika Kara says that *Sangrahi dravyas* are *Prathvi* & *Vayu* predominant and have *Rasa* other than *Lavana* & is *Ushna* and *Tikshna.*

Clinical application: *Stambhana Karma* can be used in *Pakwatisara* that it helps in holding of *Pakwa mala.*

Understanding *Grahi* & *Stambhana*

Absorption in the small intestine

Water & electrolytes are absorbed as well as secreted in the intestine. Jejunum is freely permeable to salt & water which is passively absorbed secondary to nutrient (glucose, amino acids etc.) absorption.

Absorption

Na+ Active transport-Na+ K+ AT pase mediated

H_2O follows Na+ osmotically (passive)

Cl- follows osmotically (passive)

Glucose-secondary active transport (Na-Co transport)

Amino acids-secondary active transport (Na-CO-transport)

Secretion

H+ in exhange for Na+ (Passive)

K+ in exhange for Na+ (Passive)

Thus, anything that interferes with water absorption reduces other salt & nutrient absorption also.

Diarrhoea

Diarrhoea is defined as too frequent, too precipitate passage of poorly formed stools. In pathological terms, it occurs due to passage of excess water in faeces.

Pathophysiology:

(i) Impaired absorption of water due to osmotically active substances in chyme.

(ii) Active secretion by small intestinal epithelium (Crypts of Lieberkḷhn).

(iii) Deranged intestinal motility.

(iv) Altered mucosa leading to mal absorption.

Treatment

(i) Specific treatment-depends on cause.

(ii) Correction of dehydration and electrolyte imbalance.

(iii) Supportive therapy:

Agents useful in supportive therapy are-

(a) Act locally, as protectives by coating the gut

(b) Decrease the propulsion of intestinal contents.

(c) Act directly on mucosal transport processes (anti secretary action)

(d) Act on intestinal microcirculation.

(a) Protectives and Adsorbents- These agents may be useful predominantly because of their ability to absorb noxious substances such as gases, bacteria & its toxins. In addition, some of these possess an astringent action (toughen the surface making it stronger & decrease exudation). While others protect the gastro intestinal mucous from the irritants by coating it physically.

Thus, with this back ground we can say, that a *Grahi dravya* stimulates gastric secretion, & duodenal secretion which includes bile juice and pancreatic secretion. These will help to digest the chyme.

A *Grahi dravya* also helps in proper absorption by acting on the mucosal transport processes and also decrease secretion.

Grahi- *Dipana-* Stimulates gastric secretion.

Pachana- Stimulates (Pancreatic, bile & Succus entericus).

Dravashoshana- Regulate absorption of $H2O$ & electrolytes.

Reduce secretions from intestine. A *Stambhana dravya* on the other hand, has the following effect.

Stambhana dravya- Acts on motility of intestine (decrease propulsion) Protects mucosa.

5.13 *Madakari*

बुद्धिं लुम्पति यद्रव्यं मदकारि तदुच्यते । तमो गुण प्रधानं च यथा मद्यं सुरादिकम् ॥

शा. प्र. 4/21-22

A *dravya* which is predominant with *Tamoguna* and hence hampers the mental faculties is called as *Madakari.*

E.g.: *Madya, Sura* - Alcoholic drinks

यद् द्रव्यं बुद्धिं ज्ञानविषयं लुम्पति आच्छादयति तन्मदकारि कथ्यते, अत राव तमोगुणप्रधानं तमोगुणबहुलमित्यर्थः । यथा सुरादिकं मद्यादिकम् । बुद्धिस्तु मेधाधृति स्मृति प्रतिपत्तिषु वर्तते । रातेषां लक्षणं प्रसङ्गादुच्यते । आढ़मल्ल- शा. प्र. 4/21-22

Buddhi involves *Medha, Dhriti, Smrti, Mati, Pratipatti.* A *Madakari dravya* hampers all or any of these mental faculties.

Note:

मेधा- ग्रन्थाकर्षणसामर्थ्य,

Intelligence.

धृति- धृतिः सन्तुष्टिः अन्ये नियमात्मिका बुद्धिमाहु,

Satisfaction or steadiness.

स्मृति- स्मृतिः पूर्वानुभूतस्य स्मरणम् । अर्थधारणशक्तिरित्यन्ये ।

Retention power or memory.

मति- मतिरनागतविषयोपदेशः ।

Judgement.

प्रतिपत्ति- प्रतियत्तिरर्थावबोधप्रागलभ्यामिति ।

Discriminative skill

Alcohol

Alcohol is a neuronal depressant. Since the highest areas are most easily deranged & these are primarily inhibitory apparent excitation & euphoria are experienced at lower concentrations.

Hesitation, caution, self-criticism & restraint are lost first. Mood & feelings are altered; anxiety may be allayed. With increasing concentration, mental clouding, disorganization of thought, impairment of memory & other faculties, alteration of perception & drowsiness supervenes. Performance is impaired, fine discrimination & precise movements are obliterated; errors increase. (K.D. Tripathi).

5.14 *Pramathi*

निजवीर्येण यद् द्रव्यं स्रोतोभ्यो दोषसंचयम् । निरस्यति प्रमाथि स्यात्, तद्यथा मरिचं वचा ॥

शा. प्र. 4/23-24

A *Dravya* by virtue of its potency, removes the accumulated *Doshas* from the *Srotas* is called *Pramathi.*

E.g.: *Maricha* (*Piper nigrum* Linn.), *Vacha* (*Acorus calamus* Linn.)

यद् द्रव्यं निजवीर्येण स्वप्रभावेण कृत्वा स्रोतोभ्यः कर्ण-मुख-नासिकादीनामन्यतमविवरेभ्यो दोषबाहुल्यं निरस्यति, तत् प्रमाथिसंज्ञं कथितम् । यथा-मरिचं वचा च । दोषशब्दोऽत्र व्याधिष्वापि वर्तते कारणे कार्योपचारात्: तेन व्याधि संचयमपीत्यर्थः । आढ़मल्ल दह शा. प्र. 4/23-24

Adhamalla comments *Srotas* as the channels of *Karna, Mukha, Nasa* and other channels where there is accumulation of *Dosha.*

यद् द्रव्यं निजवीर्येण स्वप्रभावेण, स्रोतोभ्यो रसवाहिसिरामार्गेभ्यो, दोषसंचयं निरस्यति दूरीकरोति, तत् प्रमाथि स्यात् । काशीराम दह शा. प्र. 4/23-24

Kashirama comments that *Srotas* here refers to *Rasavahi Sira* & a *Pramathi dravya* removes the accumulated *Doshas* in *Rasadi Srotas.*

Thus, a *Pramathi dravya* clears both external & internal pathways or channels.

5.15 *Abhishyandi*

अभिष्यन्दि दोष धातुमलस्रोतसां क्लेदप्राप्तिजननम् । (डल्हण. सु. सू. 46/51)

पैच्छिल्यात् गौरवात् द्रव्यं रुद्ध्वा रसवहाः सिराः । धत्ते यद्गौरवं तत् स्यादभिष्यन्दि यथा दधि ॥
(शा. प्र. स. 4/24)

That which blocks the channels by virtue of its *Picchilata and Guru guna.*

E.g.: *Dadhi* (Curd) & *Navadhanya* (New grains)

5.16 *Vyavayi*

पूर्वं व्याप्याखिलं कायं ततः पाकं च गच्छाति । व्यवायि तद्यथा भङ्गफेन चाहिसमुद्भवम् ॥
शा. प्र. 4/19-20

व्यवायी चाखिलं देहं व्याप्य पाकाय कल्पते । सु. सू. 46/523

व्याप्नोति देहमादौ यत् पश्चात् पाकं च गच्छति । तद् व्यवायि..................................॥
कै. नि. मि. 207

The *dravya* which spreads throughout the body and later undergoes digestion is called *Vyavayi.*

E.g.: *Bhanga (Cannabis sativa* Linn.*)*

Ahiphena (Papaver somnifera Linn.*)*

व्यवायी गुणः । अखिलमित्यादि अपक्व रावाखिलं देहं व्याप्नोति पश्चान्मद्यविषवत् पाकं यातिः अन्ये भावाय कल्पते इति पठन्ति, तत्रापि स्थितये कल्पते नोर्ध्वमधो वा प्रवर्तते इति स रावार्थः, अपरे तु पुनर्भावशब्द-मभिप्रायार्थामिच्छन्ति, तत्र नियतद्रव प्रभावेणात्मशक्यनरूपं तत्तद् द्रव्यं मद्यविषवद्विशिष्टाभिप्रायाय कल्पन इत्यर्थः । डल्हण- सु. सू. 46/523

Sushruta describes *Vyavayi* as a *Guna.* Some authors consider *Vyavayi* as a part of *Drava Guna.*

व्यवायी द्रवेऽन्तर्भूतः । हेमाद्रि on अ. हृ. सू. 1/18

व्यवायीति गुणविशेषः । अपक्वमेवाखिलं देहं व्याप्नोति पश्चान्मद्यविषवत् पाकं याति । रावं भङ्गा अहिफेनं च । आढ़मल्ल on शा. प्र. 4/19-20

Adhamalla, commentator on *Sharangadhara Samhita* says that *Vyavayi* is *Gunavishesha* special property. The constituents of the *dravya* spread first throughout the body & gets digested later like *Madya* & *Visha.* These are *Vayu* & *Akasha Mahabhuta* predominant.

Pharmacokinetics of Alcohol

Rate of alcohol absorption from stomach is dependent on its concentration, presence of food and other factors. Absorption from intestines is very fast. Thus, gastric emptying determines rate of absorption. Limited first pass metabolism occurs in stomach & liver.

Alcohol gets distributed widely in the body, crosses blood brain barrier efficiently. It is oxidized in liver to the extent of 98%. Even with high doses, not more than 10% escapes metabolism.

Alcohol requires no digestion and is metabolized rapidly. (K. D. Tripathi)

5.17 *Vikasi*

सन्धिबन्धास्तु शिथिलान्यत्करोति विकाशि तत् । विश्लेष्यौजश्च धातुभ्यो यथा क्रमुक कोद्रवाः ॥
शा. प्र. 4/20-21

विकासी विकसन्नेव धातुबन्धान् विमोक्षयेत् । सु. सू. 46/523

विकासि स्याद् सन्धिबन्ध विमोक्षयेत् ॥ कै.नि.मि. 207

The *dravya* by which *Ojus* is disunited from the *Dhatu* and loosens the *Sandhi Bandha* (Joints) is known as *Vikasi.*

These *Dravyas* are *Vayu bhuta* predominant.

E.g.: *Kramuka (Areca catechu* Linn.*)*

Kodrava (Paspalum scrobiculatum Linn.*)*

विकसन् प्रसर्पन् । रावमिति अपक्व राव सकलं देहं व्याप्य । धातुबन्धान् विमोक्षयेत् धातुशैथिल्यं करोतीत्यर्थः । डल्हण दह सु. सू. 46/523

These dravyas also spread throughout the body before digestion and exerts its effects. *Sushruta* considers *Vikasi* as a *Guna.*

विकाशी-खरे । हेमाद्रि दह अ. हृ. सू. 1/18

Hemadri put *Vikasi* as a part of *Khara Guna.*

यद द्रव्यं सन्धिबन्धान् शिथिलीभूतान् करोति तद्विकाशि बोद्धव्यम्, विकाशि इत्यपि गुणविशेषः, न केवलं सन्धि बन्धान् शिथिलान् करोति किन्तु धातुभ्य ओजो बलं विश्लेष्य विभज्य पाकं गच्छति इत्यध्याहारः । धातु शैथिल्यमपि करोति इत्यभिप्रायः । चकरादपक्वमेवेत्यत्रापि संबन्धः । क्रमुककोद्रवा इति । क्रमुकं पूगफलं कोद्रवं कुधान्य विशेषः । अतः क्रमुकोद्रवा मदकरा ज्ञेया ।........।

आढ़मल्ल दह शा. प्र. 4/20-21

It not only causes *Sandhishaithilya,* but also *Dhatu shaitilya* and *Ojokshaya.*

Properties of *Puga*

Areca catechu (Palmae)

पूगं गुरु हिमं रुक्षं कषायं ककपित्तजित् । मोहनं दीपनं रुच्यमास्यवैरस्यनाशनम् ।

भा. प्र. आम्रादिवर्ग-50

Constituents- Areca contains alkaloids like arecoline (0.1-0.5 %), Arccaine, guavicine.

Arecoline has muscarinic as well as nicotinic actions concluding those on skeletal muscle endplate. It also has prominent CNS effect.

Properties of *Kodrava (Koradushaka)*

उष्णाः कषायमधुरा रुक्षाः कटुविपाकिनः । श्लेष्मघ्न बद्धनिस्यन्दा वातपित्त प्रकोपणः ॥

सु. सू. 46/22

कोद्रवो वातलो ग्राही हिमः पित्तकफापहः । भा. प्र. धान्यवर्ग-80

Kodrava (*Paspalum scrobiculatum*-Graminae) has *Ushna Virya, Kashaya* & *Madhura Rasa, Ruksha Guna* and *Katuvipaka.* It obstructs Srotas and increase *Vata* & *Pitta Dosha.*

5.18 *Rasayana*

The word *Rasayana* comprises of two words, Viz., *Rasa* & *Ayana.*

The word *Rasa* is derived from the root 'रस गतौ' which means to move, thus, the fluid, which is on constant movement is *Rasa.*

The word Ayana is derived from the root अयनं शमनं गत्यर्थ, means moving or entrance or to carry.

तत्र रसगतौ धातुः अहरहर्गच्छतीत्यतो रसः । सु. सू. 14/13

Paribhasha

रसानां रक्तादीनामयनमाप्यायनं..........। सु. सू. 1/7

लाभोपायो हि शस्तानां रसादीनां रसायनम् । च.चि. 1-1/8

रसानां रसरक्तादिनामयनमाप्यायनं.........................अथवा रसानां रसवीर्यविपाकादिनामायुः प्रभृतिकारणानामयनं विशिष्ट लाभोपायो रसायनं, तदर्थं तन्त्रं रसायनतन्त्रम् । डल्हण-सु.सू. 1/7

Rasayana is that which carries the *Rasa* to the different parts of the body. It makes *Rasa dhatu* as an *ayana* to supply the nutrients to the concerned *Dhatu* or *Srotas*.

रसायनं च तज्ज्ञेयं यज्जराव्याधिनाशनम् । यथाऽमृता रुदन्ति च गुगुलुश्च हरीतकी ॥
शा. प्र. 4/23

Those *dravyas* which destroys *Jara* and *Vyadhi* are *Rasayana.*

E.g.: *Haritaki* (*Terminalia chebula* Retz.)
Amruta (*Tinospora cordfolia* Miers.)
Rudanti (*Cressa cretica* Linn.)
Guggulu (*Commiphora mukul* Hook. ex.)

Benefits of *Rasayana*

दीर्घमायुः स्मृतिं मेधामारोग्यं तरुणं वयः । प्रभावर्णस्वरौदार्य देहेन्द्रिय बलं परम् ॥
वाक्सिद्धिं प्रणतिं कान्तिं लभते वा रसायनात् । लाभोपायो हि शस्तानां रसादीनां रसायनम् ॥
च. चि. 1-1/7-8

If one takes *Rasayana dravya* he will have benefits like;

(i) *Dirghayu*-Longevity.
(ii) *Tarunam Vayaha*- Preservation of youth.
(iii) *Vayasthapana*-Maintains youth.
(iv) *Jara Vidhwamsi*-Destroys old age.
(v) *Brahmana*-Weight promoting.
(vi) *Vrashya*-Improves sexual ability.
(vii) *Deha Bala*-Improves physical endurance.
(viii) *Indriya Bala*- Optimal sensory cognition.
(ix) *Chakshushya*- Maintains good vision.
(x) *Smrati-Medhakara*-Improves memory & intellectual ability.
(xi) *Prabha*-Imparts charm.
(xii) *Varna*-Imparts complexion.
(xiii) *Swara*-Gives good voice.
(xiv) *Kanti*-Promotes luster.

(xv) *Pranati*-Highly adorable.

यज्जराव्याधि विध्वंसि भेषजं तद्रसायनम् ।

Hence *Vayasthapana Mahakashaya* and *Jivaniya Mahakashaya* of *Charaka* can also be considered as *Rasayana Dravyas*.

E.g.: (i) *Amalaki (Emblica officnalis* Gareth.*)*

(ii) *Pippali (Piper longum* Linn.*)*

(iii) *Shatavari (Asparagus racemosus* Willd.*)*

(iv) *Guduchi (Tinospora cordifolia* Miers.*)*

(v) *Yashtimadhu (Glycyrrhiza glabra)*

(vi) *Haritaki (Terminalia chebula)*

Clinical Application: *Rasayana Karma* has wide range of its application that it can be used by healthy individuals or among diseased people. To maintain youthfulness one can use *Rasayana Dravyas* on every day and to control the diseases also it can be utilized.

5.19 *Vajikarana*

यस्माद्द्रव्याद्भवेत्स्त्रीषु हर्षो वाजीकरं च तत् । यथा नागबलाद्याः स्युर्बीजं च कपिकच्छुजम् ॥

शा. प्र. 4/14-15

That which improves one's Sexual vigour is *Vajikara.*

E.g.: *Nagabala (Sida veronaecifolia* Lam.*)*
Kapikacchu (Mucuna pruriens Bak.*)*

येन नारीषु सामर्थ्यं वाजीवल्लभते नरः । व्रजेच्चाभ्यधिकं येन वाजीकरण मेव तत् ॥

च. चि. 2-4/51

वाजीवातिबलो येन यात्यप्रतिहतोऽङ्गनाः । भवत्यतिप्रियः स्त्रीणां येन येनोपचीयते ।

तद्वाजीकरणं तद्धि देहस्योजस्करं परम् ॥ अ. हृ. उ. 40/2-3

That which imparts sexual strength like a horse is *Vajikara* and thus help to beget a good pregnancy.

Scope of *Vajikarana*

अल्परेतसः प्रकृत्यैव स्तोकरेतसः तेषामाप्यायन निमित्तं । दुष्टरेतसो वातादि दुष्टरेतसः तेषां प्रसादनिमित्तः क्षीणरेतसः कारणैः स्वमानदल्पीभूतरेतसः तेषां उपचयनिमित्तं; विशुष्क रेतसः स्वामानादत्यर्थ क्षीणरेतसः तेषां जनननिमित्तम् । अथवाऽल्परेतसः पञ्चविशंतिमप्राप्ताः, क्षीणरेतस्तु मध्यवयसः कारणादल्पीभूतरेतसः शुष्करेतसो वृद्धाः । प्रहर्षजननार्थं चेति स्वस्थस्य शुक्रवृद्धि स्तुतिकरणार्थं चेत्यर्थः ।

Sl.No.	Condition	Caused by	Management
1.	अल्परेतस	प्रकृत्यैव स्तोकरेतस - Naturally less in quantity. पञ्चविंशतिमप्राप्ताः - Aged below 25 yrs	शुक्र अप्यायन
2.	क्षीणरेतस	कारणैः स्वमानादत्यर्थं अल्पीभूतं - Less due to a cause मध्यवयसः कारणात् - Less quantity at middle age	शुक्र उपचय
3.	विशुष्क	स्वमानादत्यर्थं क्षीणेतसः - Reduced in quantity शुष्करेतसो वृद्धाः - Reduced at old age	शुक्र जनन
4.	दुष्टि	दुष्टरेतसो वातादि दुष्टरेतसः - Vitiated by *Vatadi Dosha*	शुक्रप्रसादन

and also, for *Praharshajananartha* i.e. *Swasthasya Shukravrạddhi* (increasing quantity of semen) and *Shukra sruti* (ejaculation in the healthy).

Classification

Charaka & *Sushruta* have commentaries wherein we find references to 3 types of *Vajikarana.*

अनेन निरुक्तेन त्रिविधमपि वृष्यमवरुध्यते, यथा शुक्रवृद्धिकरं च माषादि, तथा स्रुतिकर (च्युतिकरं) सङ्कल्पादि, शुक्रस्रुतिवृद्धिकरं क्षीरादि यदुक्तमन्यत्र शुक्रस्रुतिकरं किञ्चिच्छुक्र विवर्धनम्। स्रुतिवृद्धिकरं किञ्चित् त्रिविधं वृष्यमुच्यते। (चक्र. च. चि. 2-4/51)

तत् त्रिविधं-जनकं, प्रवर्तकं, जनकप्रवर्तकं चेति। तत्र जनकं मांसघृतादिकं यतस्तद्रसादि धातुक्रमेण परिणत सत् प्रधानधातुपुष्टिं करोति; प्रवर्तकमुच्यटाचूर्णादिकं शुक्रवैरेचनिकं......... जनकप्रवर्तकं तु गव्यघृतगोधूममाष काकण्ड फलादिकम्। (डल्हण-सु. चि. 26/6)

Sl. No.	Type	Mechanism of action	Example
1.	शुक्रवृद्धिकर (शुक्रजनक)	It increases *Shukra* through *Dhatu pushti*	*Mamsa*
2.	शुक्र स्रुतिकर (शुक्र प्रवर्तक)	It improves ejaculation	*Sankalpa Ucchata curna*
3.	शुक्र वृद्धिस्रुतिकर (शुक्रजनकप्रवर्तक)	It increases *Shukra* as well as ejaculation	*Masha, Dugdha Kakandaphala*

Sharngadhara describes the following as specialities in *Vajikarana Aushadha.*

(i) *Shukrala* (ii) *Shukrapravartaka*

(iii) *Shukrajanaka* (iv) *Shukrarecana*
(v) *Shukrastambhaka* (vi) *Shukrashoshana*

(i) *Shukrala*

यस्माच्छुक्रस्य वृद्धिः स्याच्छुक्रलं च तदुच्यते । यथाऽश्वगन्धा मुसली शर्करा च शतावरी ॥

(शा. प्र. 1/15-16)

यस्मात् द्रव्यात् शुक्रस्य वृद्धिः स्यात् तत् शुक्रलं स्यात् । (आढ़मल्ल- शा. प्र. 4/15-16)

That which increases *Shukra*.

E.g.: *Ashwagandha (Withania somnifera* Dunal.*)*
Musali (Asparagus adescendans Roxb.*)*
Sharkara
Shatavari (Asparagus racemosus Willd.*)*

(ii) & (iii) *Shukrapravartaka & Janaka*

दुग्धं माषाश्च भल्लातफलमज्जामलानि च । प्रवर्तकानि कथ्यन्ते जनकानि च रेतसः ॥

(शा. प्र. 4/16-17)

न केवलं प्रवर्तकानि उत्पादकराणि च कथ्यन्ते प्रभावात् । (आढ़मल्ल-शा. प्र. 4/16-17)

That which increases production of *Shukra* as well as improves ejaculation is *Shukra pravartaka* and *Janaka.* These *Dravyas* act by virtue of *Prabhava.*

E.g.: *Dugdha, Masha, Bhallatakaphala Majja (Semecarpus anacardium* Linn.*), Amalaki (Emblica officinalis* Gareth.*) and Stri*

(iv) *Shukrarēcana*

.....................शुक्रस्य रेचनं बृहतीफलम् । (शा. प्र. 4/17)

That which improves ejaculation.

E.g.: *Brihatiphala (Solanum indicum* Linn.*)*

(v) *Shukra Stambhaka*

जातीफलं स्तम्भकं............................ । (शा. प्र. 4/18)

That which controls or stops ejaculation.

E.g.: *Jatiphala (Myristica fragrans* Houtt.*).*

(vi) *Shukra shoshana*

.... च शोषणी च हरीतकी । (शा. प्र. 4/118)

That which dries up the *Shukra*.

E.g.: *Haritaki (Terminalia chebula* Retz.*)*

Thus, we can classify *Karma* which comes under *Vajikarana* as:

i) शुक्रवृद्दिकर/शुक्रल → Increases *Shukra*

ii) शुक्रप्रवर्तक/शुक्ररेचक/शुक्रस्रुतिकर → Ejaculates *Shukra*

iii) शुक्रजनक → Influences *Shukra utpatti* (Spermatogenesis)

iv) शुक्रस्तम्भक → Helps in controlling premature ejaculation.

v) शुक्रशोषक → Reduce the liquidity of *Shukra*.

Clinical application: *Vajikarana Karma* is useful in varieties of conditions related to reproductive system like *Shukra kshaya*, *Shukra dosha* etc.

5.20 *Medhya*

मेधायै हितं मेध्यम् । (द्र. गु. वि.)
मण्डूकपर्ण्याः स्वरसः प्रयोज्यः क्षीरेण यष्टिमधुकस्य चूर्णम् ।
रसोगुडूच्यास्तु समूलपुष्प्याः कल्कः प्रयोज्यः खलु शङ्खपुष्प्याः ॥
आयुः प्रदान्यामयनाशनानि बलाग्नि वर्णस्वरवर्धनानि ।
मेध्यानि चैतानि रसायनानि मेध्या विशेषेण च शङ्खपुष्पी ॥ (च. चि. 1/3/30-31)

Charaka opines among all *Medhya raãayana dravyas*

Shankhapuhspi is said to be best.

The one which is increasing memory is called as *Medhya*. It promotes intellect, retention power and recollecting ability of a person.

Acharya Charaka refers 4 important *Medhya Rasayanas*. They are:

1. *Mandukaparni* (*Centella asiatica*) - Juice
2. *Yashtimadhu* (*Glycyrrhiza glabra*) - Powder with milk
3. *Guduchi* (*Tinospora cordifolia*) -Juice
4. *Shankhapushpi* (*Convolvulus pluricaulis*) - Root & Flower

Charaka opines tha among all the *Medhya Dravyas Shankhapushpi* may be considered as best.

Other examples: *Vacha* (*Acorus calamus*)
Jyotishmati (*Celastrus paniculatus*)
Brahmi (*Bacopa monneri*)
Kushmanda (*Benincasa hispida*)

Clinical application: To improve memory one can use *Medhya Dravya* and even in *Manasika Vikara* (mental disorders), stress related conditions also different plants having *Medhya Karma* will be beneficial.

6. Research on Karma

Harshitha Kumari, Reshmi Pushpan[1], and K. Nishteswar[2] Medohara and Lekhaniya dravyas (anti-obesity and hypolipidemic drugs) in Ayurvedic classics: A critical review. Ayu. 2013 Jan-Mar; 34(1): 1116. doi: 10.4103/0974-8520.115437

Conventional and herbal drugs are being used to lower levels of serum cholesterol to prevent this menace. In this regard, an attempt has been made to critically review the *Medohara* and *Lekhaniya* (Anti-obesity and Hypolipidemic) drugs mentioned in *Ganas* (group of drugs) of Ayurvedic classical texts which may abet our understanding of prevention and management of conditions like Dyslipidemia and its complications. Administration of drugs possessing *Tikta Rasa* (bitter taste), *Ushna Veerya* (hot in potency), *Laghu* and *Ruksha Guna* (light and dry qualities), *Katu Vipaka* and *Vata Kaphahara* actions were noted during the analysis.

Compilation and tabulation of *Lekhaneeya* (which scrapes excess *Medas*) and *Medohara* (which removes or dries up excess *Medas*) herbs were done from *Ganas* of *Charaka Samhita*, *Sushruta Samhita*, *Astanga sangraha*, and *Ashtanga Hrudaya*. *Charaka* has given single *Gana* of 10 drugs (*Lekhaniya Gana*), hile *Sushruta* and *Vagbhata* have mentioned 8 and 10 *Ganas* respectively. A total of 160 different herbs have been enlisted from these various groups. Enumeration of *Gunas* of *Medohara* drugs clearly indicate the presence f *Laghu* and *Ruksha* (67 herbs and 59 herbs respectively)

Among the analyzed drugs, *Ushna Veerya* drugs are more in number (59 herbs) in comparison to *Sheeta Veerya* (40 herbs) and only one drug is categorized under *Anushna Veerya* (*Shireesha*).

Conclusion: Drugs mentioned in each *Gana* of Ayurvedic classics have multifarious pharmacological properties. Some of the research studies carried out on these herbs confirmed both hypolipidemic and hypoglycemic activities. This observation is useful for designing new formulations to treat *Medodushti* and its complications. Drugs that are *Katu*, *Tikta*, *Kashaya* in *Rasa*, possessing *Ushna Virya*, and *Laghu Ruksha Guna* are largely responsible for *Medohara* and *Lekhaneeya* activities.

Exercises: Multiple Choice Questions (MCQ)

1. 'Kriya Lakshanam' refers to

   a. Guna b. Vipaka c. Karma d. Prabhava

   Ans: c. Karma

2. 'Yena Kurvanti Tat' refers to
   a. Virya b. Guna c. Vipaka d. Karma
   Ans: a. Virya
3. 'Yada Kurvanti' refers to
   a. Virya b. Kala c. Adhikarana d. Prabhava
   Ans: b. Kala
4. ' Yat Kurvanti' refers to
   a. Kala b. Virya c. Karma d. Adhikarana
   Ans: c. Karma
5. Mishi is given as best example for
   a. Pachana b. Anulomana c. Stambhana d. Dipana
   Ans: d. Dipana
6. Dipana can be equated with
   a. Digestants b. Appetizer c. Carminative d. Laxative
   Ans: b. Appetizer
7. Nagakeshara
   a. Anulomana b. Pachana c. Samshaman d. Samshodhana
   Ans: b. Pachana
8. Pachana can be equated with
   a. Carminative b. Laxative c. Digestants d. Appetizer
   Ans: c.Digestants
9. Both Dipana & Pachana as per Sharangadhara Samhita
   a. Nagakeshara b. Nishi c. Yashtimadhu d. Chitraka
   Ans: d. Chitraka
10. Action where the drug expel the aggravated Doshas from the body is known as
    a. Grahi b. Samshodhana c. Samshamana d. Stambhana
    Ans: b. Samshodhana
11. Devadali Phala is an example for
    a. Samshamana b. Stambhana c. Samshodhana d. Rasayana
    Ans: c. Samshodhana
12. Action where the drug doesn't expel the doshas instead subsides the aggravated doshas is known as
    a. Stambhana b. Samshamana c. Grahi d. Samshodhana
    Ans: Samshamana

13. Number of types of Samshamana as per Ashtanga Hridayakara
    a. 5 b. 6 c. 8 d. 7
    Ans: d. 7
14. The action where the drug act on partially formed Mala and assist in formation of proper Mala is called
    a. Anulomana b. Sramsana c. Bhedana d. Rechana
    Ans: a. Anulomana
15. Best example for Anulomana Karma
    a. Katuki b. Haritaki c. Aragwadha c. Trivrit
    Ans: b. Haritaki
16. Anulomana can be equated with
    a. Appetizer b. Digestant c. Carminative d. Laxative
    Ans:c. Carminative
17. Kritamaala is the best example for
    a. Anulomana b. Bhedana c. Rechana d. Sramsana
    Ans: d. Sramsana
18. Sramsana is equated with
    a. Digestant b. Laxative c. Carminative d. Appetizer
    Ans: b. Laxative
19. Katuki is the best example
    a. Anulomana b. Rechana c. Bhedana d. Sramsana
    Ans: c. Bhedana
20. The Karma where Pindita mala is expelled from the body
    a. Anulomana b. Sramsana c. Rechana d. Bhedana
    Ans: d. Bhedana
21. Trivrit is the best example for
    a. Bhedana b. Rechana c. Sramsana d. Anulomana
    Ans: b. Rechana
22. Rechana Karma is equated with
    a. Purgative b. Carminative c. Digestant d. Appetizer
    Ans: a. Purgative
23. Action where the drugs forcibly disunites the adhered Kaphadi doshas from srotas is called
    a. Bhedana b. Chedana c. Lekhana d. Stambhana
    Ans: b. Chedana

24. Shilajatu is the best example for
    a. Deepana b. Pachana c. Chedana d. Stambhana
    Ans: c. Chedana
25. That which dries up Dhatu & Mala and scrapes resulting in lean body
    a. Pachana b. Deepana c. Chedana d. Lekhana
    Ans: d. Lekhana
26. That which is both Dipana & Pachana and Drava shoshaka is
    a. Stambhana b. Grahi c. Chedana d. Lekhana
    Ans: b. Grahi
27. That which stops or obstructs motility or movement is called
    a. Grahi b. Rasayana c. Stambhana d. Lekhana
    Ans: c. Stambhana
28. Kutaja is the best example for
    a. Rasayana b. Vajikarana c. Grahi d. Stambhana
    Ans: d. Stambhana
29. The action which hampers mental faculties
    a. Pramathi b. Madakari c. Rasayana d. Medhya
    Ans: b. Madakari
30. The action where by virtue of its potency removes the accumulated Doshas from Srotas is called
    a. Madakari b. Rasayana c. Pramathi d. Vajikarana
    Ans: c. Pramathi
31. That which blocks the channel
    a. Madakari b. Pramathi c. Rasayana d. Abhishyandi
    Ans: d. Abhishyandi
32. The Dravya which spreads through out the body and later undergoes digestion
    a. Madakari b. Abhishyandi c. Pramathi d. Vyavayi
    Ans: d. Vyavayi
33. Action by which ojus is disunited from the Dhatu
    a. Vikasi b. Grahi c. Stambhana d. Grahi
    Ans: a. Vikasi
34. The action which carries Rasa to the different parts of the body
    a. Vajikarana b. Rasayana c. Dipana d. Medhya
    Ans: b. Rasayana

35. Vayasthapana is a benefit from
    a. Abhishyandi b. Vajikarana c. Rasayana d. Madakari
    Ans: c. Rasayana
36. The Karma which improves one's sexual vigour
    a. Balya b. Brahmana c. Jeevaniya d. Vajikarana
    Ans: d. Vajikarana
37. Ashwagandha is an example for
    a. Shukra shoshaka b. Shukranashaka
    c. Shukrala d. Shukra hrasaka
    Ans: c. Shukrala
38. Shukra stambhaka is
    a. Haritaki b. Jatiphala c. Ashwagandha d. Brihati Phala
    Ans: b. Jatiphala
39. The action which increases the memory
    a. Rasayana b. Vajikarana c. Medhya d. Pramathi
    Ans: c. Medhya
40. Shankhapushpi is best example for
    a. Vajikarana b. Medhya c. Shukranashakad. Shukrala
    Ans: b. Medhya

*****

Karmas of dashemanigana Charakokta Dashemani Karmas with their Rasa, Guna, Vipaka, Veerya, Dosha karma, botanical identity & pharmaco-therapeutic action of individual drugs

Charakokta Dashemani Gana Karma

Charakokta Dashemani Varga is one of the very important concepts of *Charaka* with high utility in clinical practice. A unique concept with reference to 50 *Mahakashaya Vargas* which are named and explained on the basis of *Karma* (Action) done by the drug. Each *Varga* consists of 10 drugs where in one can select a single drug or a combination of more than two drugs depending on the requirement. This serves as a ready-reckoner for a clinician and a researcher. The best and suitable drug may be selected out of the ten drugs which results in effective out come.

Special features:

1. Total number of *Varga* mentioned are 50 (Ref Cha.Su. 4).
2. Number of drugs in each *Varga* are 10
3. The basis of classification is therapeutic actions of drugs
4. Various Karmas related to *Panchakarma* (therapeutic procedures) and *Vyadhi* (Disease) etc. with high therapeutic values are mentioned.

Drugs are repeated in *vargas* as *Yashtimadhu* is mentioned in many *Varga*.

1. Jivaniya Mahakashaya Varga (Vitalizers)

जीवनीय (जीवन) -जीवनम् आयुः तस्मै हितं जीवनीयम् । जीवनीयशब्देनेहायुष्यत्वमभिप्रेतम् ।

(चक्रपाणि on च. सू. 4/8)

जीवनीयं प्राणानां संधारकम् । (इन्दु on अ. सं. सू. 34)

That which preserves or sustains life.

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Jivaka*	*Microstylis wallichi*	*Madhura*	*Guru, Snigdha*	*Madhura*	*Shita*
2.	*Rishabhaka*	*Microstylis mucifera*	*Madhura*	*Guru, Snigdha*	*Madhura*	*Shita*
3.	*Meda*	*Polygonatum cirrhafolium*	*Madhura*	*Guru, Snigdha*	*Madhura*	*Shita*

4.	*Mahameda*	*Polygonatum verticillatum*	*Madhura*	*Guru, Snigdha*	*Madhura*	*Shita*
5.	*Kakoli*	*Fritillaria roylei*	*Madhura*	*Guru, Snigdha*	*Madhura*	*Shita*
6.	*Kshira Kakoli*	*Lillium polyphyllum*	*Madhura*	*Guru, Snigdha*	*Madhura*	*Shita*
7.	*Mudgaparni*	*Phaseolus trilobus*	*Madhura*	*Guru, Snigdha*	*Madhura*	*Shita*
8.	*Mashaparni*	*Teramnus labialis*	*Madhura*	*Guru, Snigdha*	*Madhura*	*Shita*
9.	*Jivanti*	*Leptadenia reticulata*	*Madhura*	*Guru, Snigdha*	*Madhura*	*Shita*
10.	*Madhuka*	*Glycyrrhiza glabra*	*Madhura*	*Guru, Snigdha*	*Madhura*	*Shita*

Application: The plants mentioned in this *Varga* are helpful in maintaining *Sapta Dhatu* (Seven Tissues) in optimum conditions and maintain energy level to sustain the life.

2. *Brahmaniya Maha Kashaya Varga* (Nourishing)

बृंहणीय (बृंहण) - बृहत्वं यच्छरीरस्य जनयेत्तत्र बृंहणम् । (च. सू. 22/10)

बृंहणीयो देह बृंहणाय हितः । (गंगाधर- च. सू. 4/8)

That which increases the bulk in the body.

क्षीरिणी राजक्षवकाश्वगन्धाकाकोलीक्षीरकाकोलीवाट्यायानी भद्रौदनी भारद्वाजीपयस्यर्ष्यागन्धा इति दशेमानि बृंहणीयानि भवन्ति । च. सू. 4/9

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Kshirini*	*Euphorbia hirta*	*Tikta*	*Laghu*	*Katu*	*Ushna*
2.	*Rajakshavaka*	*Euphorbia microphylla*	*Tikta*	*Laghu*	*Katu*	*Ushna*
3.	*Ashwagandha*	*Withania somnifera*	*Tikta Kashaya*	*Laghu Snigdha*	*Madhura*	*Ushna*
4.	*Kakoli*	*Fritellaria roylei*	*Madhura*	*Guru, Snigdha*	*Madhura*	*Shita*
5.	*Kshirakakoli*	*Lillium polyphyllum*	*Madhura*	*Guru, Snigdha*	*Madhura*	*Shita*
6.	*Vatyayani*	*Sida cordifolia*	*Madhura*	*Guru, Snigdha*	*Madhura*	*Shita*
7.	*Bhadraudani*	*Sida veronicaefolia*	*Madhura*	*Guru, Snigdha*	*Madhura*	*Shita*
8.	*Bharadwaji*	*Thespesia lampas*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
9.	*Payasya*	*Peuraria tuberosa*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
10.	*Rushyaga-ndha*	*Argeria speciosa*	*Katu Tikta*	*Laghu Snigdha*	*Madhura*	*Ushna*

Application: Plants included are Brahmana (Bulk promoters) and beneficial for Krisha (lean persons).

3. *Lekhaniya Mahakashaya Varga* (Emaciating)

लेखनीय (लेखन) - लेखनं कर्शनम्, तस्मै हितं लेखनीयम् ।(योगेन्द्रनाथ सेन्)

लेखनं देहे उपलेपादिकान् भावान् विच्छिनत्ति । (इन्दु)

That which scrapes the adhered *Dosha* and which emaciates is *Lekhana.*

मुस्तकुष्ठहरिद्रदारुहरिद्रावचातिविषाकटुरोहिणीचित्रक चिरबिल्व हैमवत्य इति दशेमानि लेखनीयानि भवन्ति । च. सू. 4/9

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Musta*	*Cyperus rotundus*	*Tikta Kashaya*	*Laghu Ruksha*	*Katu*	*Shita*
2.	*Kushtha*	*Saussurea lappa*	*Tikta Katu*	*Laghu Ruksha*	*Katu*	*Ushna*
3.	*Haridra*	*Curcuma longa*	*Tikta Katu*	*Ruksha Laghu*	*Katu*	*Ushna*
4.	*Daruharidra*	*Berberis aristata*	*Tikta*	*Ruksha Laghu*	*Katu*	*Ushna*
5.	*Vacha*	*Acorus calamus*	*Katu Tikta*	*Laghu Tikshna*	*Katu*	*Ushna*
6.	*Ativisha*	*Aconitum hetero-phyllum*	*Katu Tikta*	*Laghu Ruksha*	*Katu*	*Ushna*
7.	*Katurohini*	*Picrorhiza kurroa*	*Tikta*	*Ruksha Laghu*	*Katu*	*Shita*
8.	*Chitraka*	*Plumbago zeylanica*	*Katu*	*Tikshna*	*Katu*	*Ushna*
9.	*Cirabilva*	*Holoptelia integrifolia*	*Tikta*	*Laghu Ruksha*	*Katu*	*Ushna*
10.	*Haimavathi*	*Iris germanica*	*Katu Tikta*	*Laghu Tikshna*	*Katu*	*Ushna*

Application: Plants mentioned in this Varga are having Lekhana Karma (scarificient actions) hence can be used for Sthoulya (Obesity).

4. *Bhedaniya Maha Kashaya* (Purgatives)

भेदनीय (भेदन) - भेदनाय शरीरान्मल दोष निर्हरणाय हितम् । (गंगाधर- च. सू. 4/8)

That which evacuates the vitiated *Dosha* and *Mala* from the body is *Bhedana.*

सुवहार्कोरुबकाग्निमुखीचित्रकचिरबिल्वशङ्खिनीशकुलादनीस्वर्णक्षीरिण्य इति दशेमानि भेदनीयाति भवन्ति । च. सू. 4/9

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Suvaha*	*Operculina turpethum*	*Katu Tikta*	*Laghu Ruksha*	*Katu*	*Ushna*
2.	*Arka*	*Calotropis procera*	*Katu Tikta*	*Laghu Tiksna*	*Katu*	*Ushna*
3.	*Urubaka*	*Ricinus communis*	*Madhura Katu*	*Tikshna Snigdha*	*Madhura*	*Ushna*
4.	*Agnimukhi*	*Gloriosa superba*	*Katu, Tikta Kashaya*	*Laghu Tikshna*	*Katu*	*Ushna*
5.	*Citra*	*Baliospermum montanum*	*Kaṭu*	*Tikshna*	*Katu*	*Ushna*
6.	*Citraka*	*Plumbago zeylanica*	*Katu*	*Tikshna*	*Katu*	*Ushna*
7.	*Cirabilva*	*Holoptelia integrifolia*	*Tikta*	*Laghu Ruksha*	*Katu*	*Ushna*
8.	*Shankhini*	*Euphorbia dracanculoides*	*Katu Tikta*	*Laghu Ruksha*	*Katu*	*Ushna*
9.	*Shakuladani*	*Picrorhiza kurroa*	*Tikta*	*Ruksha Laghu*	*Katu*	*Shita*
10.	*Swarnakshiri*	*Euphorbia thomsonia*	*Katu Tikta*	*Laghu Ruksha*	*Katu*	*Ushna*

Application: Plants mentioned in this Varga can be used to induce Virechana (Purgation) in different Vyadhis (Diseases) and also beneficial in Vibandha (Constipation).

5. *Sandhaniya Maha Kashaya Varga* (Healers)

सन्धानीय (सन्धान) - सन्धानकं शरीरेऽन्तःसंहतिकरं भावानाम् । (इन्दु)

Those which unite fractured bones & bind the normal inter cellular structures within the body, like blood clotting.

मधुकमधुपर्णीपृश्निपर्ण्यम्बष्ठकीसमंगामोचरस धातकीलोध्र प्रियङ्गुकट्फलानीति दशेमानि सन्धानीयाति भवन्ति । (च. सू. 4/9)

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Madhuka*	*Glycyrrhiza glabra*	*Madhura*	*Guru, Snigdha*	*Madhura*	*Shita*
2.	*Madhuparni*	*Tinospora cordifolia*	*Tikta Kashaya*	*Guru Snigdha*	*Madhura*	*Ushna*
3.	*Prashniparni*	*Uraria picta*	*Madhura Tikta*	*Laghu Sara*	*Madhura*	*Ushna*
4.	*Ambashtaki*	*Cissampelos pareira*	*Tikta*	*Laghu Tikshna*	*Katu*	*Ushna*

5.	*Samanga*	*Rubia cordifolia*	*Kashaya Tikta*	*Guru Ruksha*	*Katu*	*Ushna*
6.	*Mocarasa*	*Salmalia malabarica*	*Kashaya*	*Laghu Picchila*	*Katu*	*Shita*
7.	*Dhataki*	*Woodfordia fruticosa*	*Kashaya Kaṭu*	*Laghu Ruksha*	*Katu*	*Shita*
8.	*Lodhra*	*Symplocos racemosa*	*Kashaya*	*Ruksha*	*Katu*	*Shita*
9.	*Priyangu*	*Callicarpa macrophylla*	*Tikta kashaya*	*Guru Ruksha*	*Katu*	*Shita*
10.	*Katphala*	*Myrica nagi*	*Kashaya Tikta Katu*	*Laghu Tikshna*	*Katu*	*Ushna*

Application: Plants of this *Varga* can be used in case of *Bhagna* (fracture) and other injuries which promotes union.

6. *Dipaniya Maha Kashaya Varga* (Appetizers):

दीपनीय (दीपन) - दीपनीयो वन्हेरुद्धीपनाय हितम् । (गंगाधर-च. सू. 4/8)

That which stimulates digestive capacity in the body.

पिप्पलीपिप्पलीमूलचव्यचित्रकशृङ्गवेराम्लवेतसमरिचाजमोद भल्लातकास्थि हिङ्गुनिर्यासा इति दशेमानि दीपनीयानि भवन्ति । (च. सू. 4/9)

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Pippali*	*Piper longum*	*Katu*	*Tikshna Laghu*	*Madhura*	*Anushna*
2.	*Pippalimula*	Root of *Piper longum*	*Katu*	*Tikshna Laghu*	*Katu*	*Ushna*
3.	*Cavya*	*Piper caba*	*Kashaya Katu*	*Laghu Ruksha*	*Katu*	*Ushna*
4.	*Citraka*	*Plumbago zeylanica*	*Katu*	*Tikshna*	*Katu*	*Ushna*
5.	*Shrangavera*	*Zingiber officinale*	*Katu*	*Laghu Snigdha*	*Madhura*	*Ushna*
6.	*Amlavetasa*	*Garcinia pedunculata*	*Amla*	*Laghu Ruksha*	*Amla*	*Ushna*
7.	*Maricha*	*Piper nigrum*	*Katu*	*Tikshna Laghu*	*Katu*	*Ushna*
8.	*Ajamoda*	*Apium graveolens*	*Katu Tikṭa*	*Laghu Tikshna*	*Katu*	*Ushna*
9.	*Bhallatakasthi*	Seed of *Semecarpus anacardium*	*Katu Madhura*	*Laghu Snigdha*	*Madhura*	*Ushna*
10.	*Hinguniryasa*	*Ferula narthex*	*KatuTikta*	*Laghu Tikshna*	*Katu*	*Ushna*

Application: Plants of this *Varga* are much beneficial in case of *Agnimandya* (loss of appetite) as it increases bthe *Agni* (digestive fire) and much useful in various diseases where *Agnimandya* (loss of appetite) is the root cause.

7. *Balya Maha Kashaya Varga* (Strength Promoters)

बल्य - बलाय हितं बल्यम् । (गंगाधर-च. सू. 4/8)

That which increases strength of the body.

रान्द्रीऋषभ्यातिरसर्ष्यप्रोक्तोपयस्याश्वगन्धा स्थिरारोहिणीबलातिबला इति दशमानि बल्यानि भवन्ति । च. सू. 4/10

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Aindri*	*Bacopa monnieri*	*Tikta Kashaya*	*Laghu Sara*	*Madhura*	*Shita*
2.	*Rishabhi*	*Mucuna prurita*	*Madhura Tikta*	*Guru Snigdha*	*Madhura*	*Ushna*
3.	*Atirasa*	*Asparagus racemosus*	*Kashaya Kaṭu*	*Guru Snigdha*	*Madhura*	*Shita*
4.	*Rushyaprokta*	*Teramnus labialis*	*Madhura Tikta*	*Laghu Snigdha*	*Madhura*	*Shita*
5.	*Payasya*	*Ipomoea digitata*	*Madhura Tikta*	*Gruru Snigdha*	*Madhura*	*Shita*
6.	*Ashwagandha*	*Withania somnifera*	*Tikta Kashaya*	*Laghu Snigdha*	*Madhura*	*Ushna*
7.	*Sthira*	*Desmodium gangeticum*	*Madhura Tikta*	*Gruru Snigdha*	*Madhura*	*Shita*
8.	*Rohini*	*Picrorrhiza kurroa*	*Tikta*	*Ruksha Laghu*	*Katu*	*Shita*
9.	*Bala*	*Sida cordifolia*	*Madhura*	*Snigdha Guru*	*Madhura*	*Shita*
10.	*Atibala*	*Abutilon indicum*	*Madhura*	*Snigdha Guru*	*Madhura*	*Shita*

Application: The plants mentioned in this *Varga* are useful in increasing the strength hence beneficial in *Daurbalya* (General debility).

8. *Varnya Maha Kashaya Varga* (Complexion of Promoters)

वर्ण्य - वर्णाय हितं वर्ण्यम् । (गंगाधर-च. सू. 4/8)

That which normalizes & improves complexion of skin.

चन्दनतुङ्गपद्मकोशीरमधुकमञ्जिष्ठासारिवापयस्यासितालता इति दशेमानि वर्ण्यानि भवन्ति ।
च. सू. 4/10

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Chandana*	*Santalum album*	*Tikta Madhura*	*Ruksha Laghu*	*Katu*	*Shita*
2.	*Tunga*	*Callophyllum inophyllum*	*Kashaya Tikta*	*Guru Ruksa*	*Katu*	*Ushna*
3.	*Padmaka*	*Prunus cerasoides*	*Kashaya Tikta*	*Laghu Snigdha*	*Katu*	*Shita*
4.	*Ushira*	*Vetiveria zizanoides*	*Tikta Madhura*	*Laghu Snigdha*	*Madhura*	*Shita*
5.	*Madhuka*	*Glycyrrhiza glabra*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
6.	*Manjishtha*	*Rubia cordifolia*	*Kashaya Tikta*	*Guru Ruksa*	*Katu*	*Ushna*
7.	*Sariva*	*Hemidesmus indicus*	*Tikta Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
8.	*Payasya*	*Ipomoea digitata*	*Madhura Tikta*	*Gruru Snigdha*	*Madhura*	*Shita*
9.	*Sita*	*Cynodon dactylon*	*Tikta Madhura*	*Laghu*	*Madhura*	*Shita*
10.	*Lata*	*Cynodon dactylon*	*Tikta Madhura*	*Laghu*	*Madhura*	*Shita*

Application: Plants in this *Varga* improving the complexion hence can be used in depigmentation and also in case of skin diseases.

9. *Kanthya Maha Kashaya Varga* (Good for Throat)

कण्ठ्य - कण्ठस्य स्वराय हितं कण्ठ्यम् । (गंगाधर-च. सू. 4/8)

That which improves voice.

सारिवेक्षुमूलमधुकपिप्पलीद्राक्षाविदारीकैटर्यहंसपादीबृहतीकण्टकारिका इति दशेमानि कण्ठ्यानि भवन्ति । च. सू. 4/10

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Sariva*	*Hemidesmus indicus*	*Tikta Madhura*	*Guru Snigdha*	*Madhura*	*Shita*

2.	*Ikshumula*	Root of *Saccharum officinarum*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
3.	*Madhuka*	*Glycyrrhiza glabra*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
4.	*Pippali*	*Piper longum*	*Katu*	*Tikshna Laghu*	*Madhura*	*Anush-na*
5.	*Draksha*	*Vitis vinifera*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
6.	*Vidari*	*Pueraria tuberosa*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
7.	*Kaitarya*	*Myrica nagi*	*Kashaya Tikta Katu*	*Laghu Tikshna*	*Katu*	*Ushna*
8.	*Hamsapadi*	*Adiantum lunulatum*	*Katu Tikta*	*Laghu Ruksha*	*Katu*	*Ushna*
9.	*Brahati*	*Solanum indicum*	*Katu Tikta*	*Laghu Ruksha*	*Katu*	*Ushna*
10.	*Kantakari*	*Solanum xantho-carpum*	*Tikta Katu*	*Laghu Ruksha*	*Katu*	*Ushna*

Application: Plants of this *Varga* are improving the voice and also useful in diseases of throat.

10. *Hradya Maha Kashaya Varga* (Cardiotonics)

हृद्य - हृदयाय मनसे हितं हृद्यम् । (गंगाधर-च. सू. 4/8)

That which pleases the mind & beneficial for heart.

आम्राम्रातकलिकुचकरमर्दवृक्षाम्लाम्लवेतसकुवलबदरदाडिममातुलुङ्गानीति दशेमानि हृद्यानि भवन्ति । च. सू. 4./10

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Amra*	*Mangifera indica*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
2.	*Amrataka*	*Spondias mangifera*	*Amla*	*Laghu Ruksha*	*Amla*	*Ushna*
3.	*Likucha*	*Artocarpus lakoocha*	*Amla*	*Laghu Ruksha*	*Amla*	*Ushna*
4.	*Karamarda*	*Carissa carandus*	*Amla*	*Laghu Ruksha*	*Amla*	*Ushna*
5.	*Vrakshamla*	*Garcinia indica*	*Amla*	*Laghu Ruksha*	*Amla*	*Ushna*
6.	*Amlavetasa*	*Garcinia pedunculata*	*Amla*	*Laghu Ruksha*	*Amla*	*Ushna*
7.	*Kuvala*	*Zizyphus sativa*	*Madhura, Amla Kashaya*	*Picchila Guru*	*Madhura*	*Shita*
8.	*Badara*	*Zizyphus jujuba*	*Madhura, Amla Kashaya*	*Picchila Guru*	*Madhura*	*Shita*

9.	*Dadima*	*Punica granatum*	*Madhura Kashaya*	*Laghu Snigdha*	*Madhura*	*Anu-shna*
10.	*Matulunga*	*Citrus medica*	*Madhura*	*Laghu Snigdha*	*Madhura*	*Shita*

Application: The plants mentioned in this *Varga* are considered as Cardiotonic and hence can be used in *Hridroga* (Cardiac disorders).

11. *Traptighna Maha Kashaya Varga* (Digestants)

तृप्तिघ्न - तृप्तिः श्लेष्मविकारो, येन तृप्तमिवात्मानं मन्यते, तदघ्नं तृप्तिघ्नम।

(चक्रपाणि-च. सू. 4/8)

That which alleviates *Tripti (Aruchi)* and is also beneficial as *Shleshmahara* is *Triptighna.*

नागरचव्यचित्रकविडङ्गमूर्वागुडूचीवचामुस्तपिप्पलीपटोलानीति दशेमानि तृप्तिघ्नानि भवन्ति ।

च. सू. 4/19

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Nagara*	*Zingiber officinale*	*Katu*	*Tiksna Ruksha*	*Madhura*	*Ushna*
2.	*Chavya*	*Piper chaba*	*Kashaya Katu*	*Laghu Ruksha*	*Katu*	*Ushna*
3.	*Chitraka*	*Plumbago zeylanica*	*Katu*	*Tikshna*	*Katu*	*Ushna*
4.	*Vidanga*	*Embelia ribes*	*Katu Kashaya*	*Laghu Ruksha*	*Katu*	*Ushna*
5.	*Murva*	*Marsedenia tenacissima*	*Madhura Tikta*	*Guru Ruksha*	*Katu*	*Ushna*
6.	*Guduchi*	*Tinospora cordifolia*	*Tikta Kashaya*	*Guru Snigdha*	*Madhura*	*Ushna*
7.	*Vacha*	*Acorus calamus*	*Katu Tikta*	*Laghu Tikshna*	*Katu*	*Ushna*
8.	*Musta*	*Cyperus rotundus*	*Tikta Kashaya*	*Laghu Ruksha*	*Katu*	*Shita*
9.	*Pippali*	*Piper longum*	*Katu*	*Tikshna Laghu*	*Madhura*	*Anus-hna*
10.	*Patola*	*Trichosanthes dioica*	*Tikta*	*Laghu snigdha*	*Katu*	*Ushna*

Application: *Trapti* is the condition where individual does not want to consume anything. The plants mentioned in this *Varga* are useful to relieve this condition.

12. *Arshoghna Mahakashaya Varga* **(Anti-haermorrhoidal)**

अर्शोघ्न - अर्शांसि हन्तीति अर्शोघ्नम् ।

That which destroys *Arshas* is *Arshoghna*

कुटज बिल्व चित्रकनागरातिविषाभयाधन्वयासकदारुहरीद्रावचाचव्यानीति दशेमानि अर्शोघ्नानि भवन्ति । च. सू. 4/11

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Kutaja*	*Holarrhena antidysenterica*	*Tikta Kashaya*	*Laghu Ruksha*	*Katu*	*Shita*
2.	*Bilwa*	*Aegle marmelos*	*Tikta*	*Laghu Ruksha*	*Katu*	*Ushna*
3.	*Chitraka*	*Plumbago zeylanica*	*Katu*	*Tikshna*	*Katu*	*Ushna*
4.	*Nagara*	*Zingiber officinale*	*Katu*	*Tiksna Ruksha*	*Madhura*	*Ushna*
5.	*Ativisha*	*Aconitum heterophyllum*	*Katu Tikta*	*Laghu Ruksha*	*Katu*	*Ushna*
6.	*Abhaya*	*Terminalia chebula*	*Kashaya pradhana Pancarasa*	*Laghu Ruksha*	*Madhura*	*Ushna*
7.	*Dhanvayasaka*	*Fagonia critica*	*Kashaya Tikta*	*Laghu Snigdha*	*Madhura*	*Shita*
8.	*Daruharidra*	*Berberis aristata*	*Tikta*	*Ruksha Laghu*	*Katu*	*Ushna*
9.	*Vacha*	*Acorus calamus*	*Katu Tikta*	*Laghu Tikshna*	*Katu*	*Ushna*
10.	*Chavya*	*Piper chaba*	*Kashaya Katu*	*Laghu Ruksha*	*Katu*	*Ushna*

Application: Plants mentioned in this Varga are useful in *Shushka Arshas* (Piles) and *Rakta Arshas* (Haemarrhoids).

13. *Kushthaghna Mahakashaya Varga* **(Anti-dermatosis)**

कुष्ठघ्न - कुष्ठ हन्तीति कुष्ठघ्नम् ।

That which mitigates *Kushtha* is *Kushthaghna*

खदिराभयामलकहरिद्रारुष्करसप्तपर्णारग्वधकरवीरविडङ्ग जातीप्रवाला इति दशेमानि कुष्ठघ्नानि भवन्ति । च. सू. 4/11

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Khadira*	*Acacia catechu*	*Tikta Kashaya*	*Laghu Ruksha*	*Katu*	*Shita*
2.	*Abhaya*	*Terminalia chebula*	*Kashaya Pancha-rasa pradhana*	*Laghu Ruksha*	*Madhura*	*Ushna*
3.	*Amalaka*	*Phyllanthus emblica*	*Amlapra-dhana*	*Ruksha Laghu*	*Madhura*	*Shita*
4.	*Haridra*	*Curcuma longa*	*Tikta Katu*	*Ruksha Laghu*	*Katu*	*Ushna*
5.	*Arushkara*	*Semecarpus anacardium*	*Katu Madhura*	*Laghu Snigdha*	*Madhura*	*Ushna*
6.	*Saptaparna*	*Alstonia scholaris*	*Tikta Kashaya*	*Laghu Snigdha*	*Katu*	*Ushna*
7.	*Aragwadha*	*Casia fistula*	*Madhura Tikta*	*Guru Snigdha*	*Madhura*	*Shita*
8.	*Karavira*	*Nerium odorum*	*Katu Tikta*	*Laghu Ruksha*	*Katu*	*Ushna*
9.	*Vidanga*	*Embelia ribes*	*Kaṭu Kashaya*	*Laghu Ruksha*	*Katu*	*Ushna*
10.	*Jatipravala*	*Jasminum officinale*	*KatuTikta*	*Laghu Snigdha*	*Katu*	*Ushna*

Application: Plants mentioned in this *Varga* are useful in *Kushtha* (skin diseases) and it is good for skin also.

14. *Kandughna Mahakashaya Varga* (Anti-pruritic)

कण्डूघ्न - कण्डूं हन्तीति कण्डूघ्नम् ।

That which eradicates Kandu is Kandughna

चन्दननलदकृतमालनक्तमालनिम्बकुटजसर्षपमधुकदारुहरिद्रामुस्तानीति दशेमानि कण्डूघ्नानि भवन्ति । च. सू. 4/11

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Chandana*	*Santalum album*	*Tikta Madhura*	*Rūksa Laghu*	*Katu*	*Shita*
2.	*Nalada*	*Nardostachys jatamansi*	*Tikta Kashaya*	*Laghu Snigdha*	*Katu*	*Shita*

3.	*Kratamala*	*Cassia fistula*	*Madhura Tikta*	*Guru Snigdha*	*Madhura*	*Shita*
4.	*Naktamala*	*Pongamia pinnata*	*Tikta Katu Kashaya*	*Laghu Tikshna*	*Katu*	*Ushna*
5.	*Nimba*	*Azadirachta indica*	*Tikta Kashaya*	*Laghu Ruksha*	*Katu*	*Shita*
6.	*Kutaja*	*Holarrhena antidysenterica*	*Tikta Kashaya*	*Laghu Ruksha*	*Katu*	*Shita*
7.	*Sarshapa*	*Brassica campestris*	*Katu Tikta*	*Tikshna Snigdha*	*Katu*	*Ushna*
8.	*Madhuka*	*Glycyrrhiza glabra*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
9.	*Haridra*	*Curcuma longa*	*Tikta Katu*	*Ruksha Laghu*	*Katu*	*Ushna*
10.	*Musta*	*Cyperus rotundus*	*Tikta Kashaya*	*Laghu Ruksha*	*Katu*	*Shita*

Application: The plants of this *Varga* are having *Kandughna Karma* hence can be used in various diseases having *Kandu* (itching).

15. *Krimighna Mahakashaya Varga* (Anthelmintics)

कृमिघ्न - कृमीन् हन्तीति कृमिघ्नम् ।

That which removes or destroys *Krimi* is *Krimighna*

अक्षीवमरिचगण्डीरकेबुकविडङ्गनिर्गुण्डीकिणिहीश्वदंष्ट्रावृषपर्णीकाखुपर्णिका इति दशेमानि क्रिमिघ्नानि भवन्ति । (च. सू. 4/11)

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Akshiva*	*Moringa oleifera*	*Katu*	*Ruksha Tikshna*	*Katu*	*Ushna*
2.	*Maricha*	*Piper nigrum*	*Katu*	*Tikshna Laghu*	*Katu*	*Ushna*
3.	*Gandira*	Stem part of *Ferula narthex*	*KatuTikta*	*Laghu Tikshna*	*Katu*	*Ushna*
4.	*Kebuka*	*Costus speciousus*	*Tikta Kashaya*	*Laghu Ruksha*	*Katu*	*Shita*
5.	*Vidanga*	*Embelia ribes*	*Katu Kashaya*	*Laghu Ruksha*	*Katu*	*Ushna*
6.	*Nirgundi*	*Vitex negundo*	*Tikta Katu*	*Laghu Ruksha*	*Katu*	*Ushna*
7.	*Kinihi*	*Achyranthes aspera*	*Tikta Katu*	*Sara, Tikshna*	*Katu*	*Ushna*

8.	*Shwada-mshtra*	*Tribulus terrestris*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
9.	*Vrashaparni*	*Ipomoea sp*	*Tikta Katu*	*Sara, Tikshna*	*Katu*	*Ushna*
10.	*Akhuparni*	*Ipomoea reniforms*	*Tikta Katu*	*Sara, Tikshna*	*Katu*	*Ushna*

Application: The plants of this *Varga* are used in *Krimi* (worm infestation).

16. *Vishaghna Mahakashaya Varga* (Anti-poisonous)

विषघ्न - विषं हन्तीति विषघ्नम् ।

That which destroys *Visha* and its effect is *Vishaghna*.

हरिद्रामञ्जिष्ठासुवहासूक्ष्मैलापालिन्दीचन्दनकतकशिरीषसिन्धुवारश्लेष्मातका इति दशेमानि विषघ्नानि भवन्ति । च. सू. 4/11

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Haridra*	*Curcuma longa*	*Tikta Katu*	*Ruksha Laghu*	*Katu*	*Ushna*
2.	*Manjishtha*	*Rubia cordifolia*	*Kashaya Tikta*	*Guru Ruksha*	*Katu*	*Ushna*
3.	*Suvaha*	*Pluchea lanceolata*	*Tikta*	*Guru*	*Katu*	*Ushna*
4.	*Sukshmaila*	*Elettaria cardamo-mum*	*Katu Madhura*	*Laghu Ruksha*	*Madhura*	*Shita*
5.	*Palindi*	*Ichnocarpus frutiscens*	*Tikta Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
6.	*Chandana*	*Santalum album*	*Tikta Madhura*	*Ruksha Laghu*	*Katu*	*Shita*
7.	*Kataka*	*Strychnos potatorum*	*Madhura Kashaya Tikta*	*Guru Vishada*	*Madhura*	*Shita*
8.	*Shirisha*	*Albizzia labback*	*Kashaya Tikta*	*Laghu Ruksha*	*Katu*	*Anus-hna*
9.	*Sindhuvara*	*Vitex negundo*	*Tikta Katu*	*Laghu Ruksha*	*Katu*	*Ushna*
10.	*Shleshma-taka*	*Cordia dichotoma*	*Madhura Kashaya Tikta*	*Guru Vishada*	*Madhura*	*Shita*

Application: Preparations from the plants mentioned in this *Varga* can be used in various Vish Vikara (poisonous conditions).

17. *Stanyajanana Mahakashaya Varga* (Breast milk promoters)

स्तन्य जनन - स्तन्यं जनयतीति स्तन्य जननम् ।

That which increases breast milk production is *Stanyajanana.*

वीरणशालिषष्टिकेक्षुवालिकादर्भकुशकाशगुन्द्रेत्कटतृणमूलानीति दशेमानि स्तन्यजननानि भवन्ति । च. सू. 4/12

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Virana*	*Vetiveria zizanoides*	*Tikta Madhura*	*Laghu Snigdha*	*Madhura*	*Shita*
2.	*Shali*	*Oryza sativa*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
3.	*Shashtika Shal*	*Oryza* Sp	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
4.	*Ikshuvalika*	*Asteracantha longifolia*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
5.	*Darbha*	*Imperata cylindrica*	*Madhura*	*Laghu Snigdha*	*Madhura*	*Shita*
6.	*Kusha*	*Demostachya bipinnata*	*Madhura Kashaya*	*Laghu Snigdha*	*Madhura*	*Shita*
7.	*Kasha*	*Sacharum spontaneum*	*Madhura Tikta*	*Laghu Snigdha*	*Madhura*	*Shita*
8.	*Gundra*	*Typha angustata*	*Madhura Tikta*	*Laghu Snigdha*	*Madhura*	*Shita*
9.	*Itkata*	*Typha elephantina*	*Madhura Tikta*	*Laghu Snigdha*	*Madhura*	*Shita*
10.	*Katrana*	*Cymbopogan schoenanthus*	*Madhura Tikta*	*Laghu Snigdha*	*Madhura*	*Shita*

Application: Preparations from the plants mentioned in this *Varga* can be used in *Stanya kshaya* (scanty breast milk) as it increases the quantity of breastmilk.

18. *Stanya Shodhana Mahakashaya Varga* (Galactopurificators)

स्तन्यशोधन - दोषदूषितं स्तन्यं शोधयतीति स्तन्यशोधनम् ।

That which purifies the vitiated breast milk.

पाठामहौषधसुरदारुमुस्तमूर्वागुडूचीवत्सकफलकिराततिक्तकटुरोहिणीसारिवा इति स्तन्यशोधनानि भवन्ति । च. सू. 4/12

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Patha*	*Cissampelos pareira*	*Tikta*	*Laghu Tikshna*	*Katu*	*Ushna*
2.	*Mahau-shadhi*	*Zingiber officinale*	*Katu*	*Laghu Snigdha*	*Madhura*	*Ushna*
3.	*Suradaru*	*Cedrus deodara*	*Tikta*	*Laghu Tikshna*	*Katu*	*Ushna*
4.	*Musta*	*Cyperus rotundus*	*Tikta Kashaya*	*Laghu Ruksha*	*Katu*	*Shita*
5.	*Murva*	*Marsedenia tenacissima*	*Madhura Tikta*	*Guru Ruksha*	*Katu*	*Ushna*
6.	*Guduchi*	*Tinospora cordifolia*	*Tikta Kashaya*	*Guru Snigdha*	*Madhura*	*Ushna*
7.	*Vatsaka-phala*	*Holarrhena antidy-senterica - Seed*	*Katu Tikta*	*Laghu Ruksha*	*Katu*	*Shita*
8.	*Kiratatikta*	*Swertia chirata*	*Tikta*	*Laghu Ruksha*	*Katu*	*Shita*
9.	*Katurohini*	*Picrorrhiza kurroa*	*Tikta*	*Ruksha Laghu*	*Katu*	*Shita*
10.	*Sariva*	*Hemidesmus indicus*	*Tikta Madhura*	*Guru Snigdha*	*Madhura*	*Shita*

Application: Medicinal plants in this *Varga* are useful in varities of *Stanya Dosha* (vitiation of Breast milk) as they purify the breast milk.

19. *Shukrajanana Mahakashaya Varga* (Spermatogenic)

शुक्रजनन (शुक्रल) - शुक्रं जनयति इति शुक्रजननम् ।

That which increases sperm production.

जीवकर्षभककाकोलीक्षीरकाकोलीमुद्गपर्णीमाषपर्णीमेदावृद्धरुहा जटिलाकुलिङ्गा इति दशेमानि शुक्रजननानि भवन्ति । च. सू. 4/12

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Jivaka*	*Microstylis wallichi*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
2.	*Rushabhaka*	*Microstylis species*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
3.	*Kakoli*	*Lillium polyphyllum*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
4.	*Kshirakakoli*	*Lillium* species	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
5.	*Mudgaparni*	*Phaseolus trilobus*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
6.	*Mashaparni*	*Teramnus labialis*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*

7.	*Meda*	*Polygonatum verticillatum*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
8.	*Vraddharuha*	*Asparagus racemosus*	*Katu Tikta*	*Laghu Snigdha*	*Madhura*	*Ushna*
9.	*Jatila*	*Nardostachys jatamansi*	*Tikta Kashaya*	*Laghu Snigdha*	*Katu*	*Shita*
10.	*Kulinga*	Ucchita -*Abrus precatorius* - White	*Tikta Kashaya*	*Tikshna Laghu*	*Katu*	*Ushna*

Application: Plants included in this *Varga* are useful in *Shukra Kshaya* (reduced sperm) as they increase *Shukra* (Spermatogenic).

20. *Shukrashodhana Mahakashaya Varga* (Spermato purification)

शुक्रशोधन - शुक्रं शोधयतीति शुक्रशोधनम् ।

That which purifies the vitiated *Shukra.*

कुष्ठैलवालुककट्फलसमुद्रफेनकदम्बनिर्यासेक्षुकाण्डेक्ष्विक्षुरक वसुकोशीरा-णीति दशेमानि शुक्रशोधनानि भवन्ति । च. सू. 4/12

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Kushtha*	*Sassurea lappa*	*Tikta Katu*	*Laghu Ruksha*	*Katu*	*Ushna*
2.	*Elavaluka*	*Prunus cerasus*	*Kashaya Tikta*	*Laghu Snigdha*	*Katu*	*Shita*
3.	*Katphala*	*Myrica nagi*	*Kashaya Tikta Katu*	*Laghu Tikshna*	*Katu*	*Ushna*
4.	*Samudra-phena*	*Sepia afficinalis* - cuttle fish	*Tikta Katu*	*Laghu Ruksha*	*Katu*	*Ushna*
5.	*Kadamba niryasa*	*Anthocephalus cadamba*	*Madhura Tikta Kashaya*	*Ruksha*	*Katu*	*Shita*
6.	*Ikshu*	*Saccharum officinarum*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
7.	*Kandekshu*	*Saccharum spontaneum*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
8.	*Ikshuraka*	*Asteracantha longifolia*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
9.	*Vasuka*	*Calotropis procera*	*Katu Tikta*	*Laghu Tiksna*	*Katu*	*Ushna*
10.	*Ushira*	*Vettiveria zizanoides*	*Tikta Madhura*	*Laghu Snigdha*	*Madhura*	*Shita*

Application: The plants included in this will purify the *Shukra* (sperm) hence can be used in *Shukra Dushti* (vitiation of sperm).

21. *Snehopaga Mahakashaya Varga* (Adjuvant of oleation)

श्नेहोपग - स्नेहनस्य सर्पिरादेः स्नेहनक्रियायां सहायत्वेनोपगच्छतीति स्नेहोपगम् ।

(चक्रपाणि-च. सू. 4/8)

That which is used as an adjuvant to *Snehana karma* & thus enhances *Snehana* property.

मृद्वीकामधुकमधुपर्णी मेदाविदारीकाकोलीक्षीरकाकोलीजीवकजीवन्तीशालपर्ण्य इति दशेमानि स्नेहोपगानि भवन्ति । (च. सू. 4/13)

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Mradwika*	*Vitis vinifera*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
2.	*Madhuka*	*Glycyrrhiza glabra*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
3.	*Madhuparni*	*Tinospora cordifolia*	*Tikta Kasshaya*	*Guru Snigdha*	*Madhura*	*Ushna*
4.	*Meda*	*Polygonatum verticillatum*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
5.	*Vidari*	Peuraria tuberosa	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
6.	*Kakoli*	*Lillium polyphyllum*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
7.	*Kshira Kakoli*	*Lillium* Sp	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
8.	*Jivaka*	*Microstylis wallichi*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
9.	*Jivanti*	*Leptadenia reticulata*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
10.	*Shalaparni*	*Desmodium gangeticum*	*Madhura Tikta*	*Gruru Snigdha*	*Madhura*	*Shita*

Application: Plants mentioned in this *Varga* can help in proper conduction of *Snehana* (Oleation) once it is used with main *Snehana Dravya*.

22. *Swedopaga Mahakashaya Varga* (Adjuvant of sudation)

स्वेदोपग - स्वेदन द्रव्यस्य अग्न्यादेः स्वेदनक्रियायां सहायत्वनोपगच्छतीति स्वेदोपगम् ।

(चक्रपाणि-च. सू. 4/8)

That which is used as an adjuvant to *Swedana karma* to enhance its quality of *Swedana*.

शोभाञ्जनकैरण्डार्कवृश्चीरपुनर्नवायवतिलकुलत्थमाषबदराणीति दशेमानि स्वेदोपगानि भवन्ति ।

च. सू. 4/13

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Shobhanjana*	*Moringa oleifera*	*Katu*	*Ruksha Tikshna*	*Katu*	*Ushna*
2.	*Eranda*	*Ricinus communis*	*Madhura Kaṭu*	*Tikshna Snigdha*	*Madhura*	*Ushna*
3.	*Arka*	*Calotropis procera*	*Katu Tikta*	*Laghu Tikshna*	*Katu*	*Ushna*
4.	*Vraschira*	*Trianthema portul-acastrum*	*Katu*	*Laghu Ruksha*	*Katu*	*Ushna*
5.	*Punarnava*	*Boerhavia diffusa*	*Tikta*	*Laghu Ruksha*	*Katu*	*Shita*
6.	*Yava*	*Hordeum vulgare*	*Madhura*	*Laghu Ruksha*	*Katu*	*Shita*
7.	*Tila*	*Sesamum indicum*	*Madhura Kashaya*	*Guru snigdha*	*Katu*	*Ushna*
8.	*Kulattha*	*Dolichos biflorus*	*Kashaya*	*Laghu Ruksha*	*Katu*	*Ushna*
9.	*Masha*	*Phaseolus mungo*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
10.	*Badara*	*Zizyphus jujuba*	*Madhura, Amla Kashaya*	*Picchila Guru*	*Madhura*	*Shita*

Application: Plants mentioned in this *Varga* can help in proper conduction of *Swedana* (Sudation) once it is used with main *Swedana Dravya*.

23. *Vamanopaga Mahakashaya Varga* (Sub-emetics)

वमनोपग - वमनद्रव्यस्य मदनफलादेर्वमनक्रियायां सहायत्वेनोपगच्छतीति वमनोपगम् ।

(चक्रपाणि-च. सू. 4/8)

That which is used as a subordinate to *Vamana Karma.*

मधुमधुककोविदारकर्बुदारनीपविदुलबिम्बीशणपुष्पीसदापुष्याप्रत्यक्पुष्पा इति दशेमानि वमनोपगाति भवन्ति । च. सू. 4/13

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Madhu*	Honey	*Kashaya*	*Ruksha*	*Katu*	*Ushna*
2.	*Madhuka*	*Glycyrrhiza glabra*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
3.	*Kovidara*	*Bauhinia purpurea*	*Kashaya*	*Ruksha Laghu*	*Katu*	*Shita*
4.	*Karbudara*	*Bauhinia variegata*	*Kashaya*	*Ruksha Laghu*	*Katu*	*Shita*
5.	*Nipa*	*Anthocepalus cadamba Kashaya*	*Madhura Tikta*	*Ruksha*	*Katu*	*Shita*

6.	*Vidula*	*Barringtonia acutangula*	*Kashaya*	*Ruksha*	*Katu*	*Shita*
7.	*Bimbi*	*Coccinia indica*	*Kashaya*	*Ruksha*	*Katu*	*Shita*
8.	*Shanapushpi*	*Crotalaria verrucosa*	*Katu Tikta*	*Laghu Tikshna*	*Katu*	*Ushna*
9.	*Sadapushpa*	*Calotropis gigantea*	*Katu Tikta*	*Laghu Tikshna*	*Katu*	*Ushna*
10.	*Pratyakpu-shpa*	*Achyranthes aspera*	*Tikta Katu*	*Sara, Tikshna*	*Katu*	*Ushna*

Application: Plants mentioned in this *Varga* can help in proper conduction of *Vamana* (Emetic therapy) once it is used with main *Vamana Dravya.*

24. *Virechanopaga Mahakashaya Varga* (Sub-purgatives)

विरेचनोपग - विरेचनद्रव्यस्य त्रिवृतादेर्विवेचनक्रियायां सहायत्वेनोपगच्छतीति विरेचनोपगम्।

(चक्रपाणि-च. सू. 4/8)

That which are used along with *Trivratadi Virechana Dravya* to enhance its property.

द्राक्षाकाश्मर्यपरुषकाभयामलकविभीतककुवलबदरकर्कन्धुपीलूनीति दशेमानि विरेचनोपगानि भवन्ति। च. सू. 4/13

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Draksha*	*Vitis vinifera*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
2.	*Kashmarya*	*Gmelina arborea*	*Tikta Kashaya*	*Laghu Ruksha*	*Katu*	*Ushna*
3.	*Parushaka*	*Grewia asiatica*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
4.	*Abhaya*	*Terminalia chebula*	*Kashaya pradhana Pancarasa*	*Laghu Ruksha*	*Madhura*	*Ushna*
5.	*Amalaka*	*Emblica officinalis*	*Amlapra-dhana*	*Ruksha Laghu*	*Madhura*	*Shita*
6.	*Vibhitaka*	*Terminalia belirica*	*Kashaya*	*Ruksha Laghu*	*Madhura*	*Ushna*
7.	*Kuvala*	*Zizyphus sativa*	*Madhura, Amla Kasshaya*	*Picchila Guru*	*Madhura*	*Shita*
8.	*Badara*	*Zizyphus mauritiana*	*Madhura, Amla Kasshaya*	*Picchila Guru*	*Madhura*	*Shita*

9.	*Karkandhu*	*Zizyphus nummularia*	*Madhura, Amla Kashaya*	*Picchila Guru*	*Madhura*	*Shita*
10.	*Pilu*	*Salvadora persica*	*Tikta Madhura*	*Laghu Snigdha*	*Katu*	*Ushna*

Application: Plants mentioned in this *Varga* can help in proper conduction of *Virechana* (Purgation therapy) once it is used with main *Virehana Dravya.*

25. *Asthapanopaga Mahakashaya Varga* (Adjuvants of *Niruha Basti*)

आस्थापनोपग - आस्थापन द्रव्याणां पाटलादीनामास्थापनक्रियायां सहायत्वेनोपगच्छतीति आस्थापनोपगम्। (चक्रपाणि-च. सू. 4/8)

That which are used as adjuvant to Asthapana *Basti*

त्रिवृद्बिल्वपिप्पलीकुष्ठसर्षपवचावत्सकफलशतपुष्पामधुकमदनफलानीति दशेमानि आस्थापनोपगानि भवन्ति। (च. सू. 4/13)

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Trivrit*	*Operculina turpethum*	*Katu Tikta*	*Laghu Ruksha*	*Katu*	*Ushna*
2.	*Bilva*	*Aegle marmelos*	*Tikta*	*Laghu Ruksha*	*Kaṭu*	*Ushna*
3.	*Pippali*	*Piper longum*	*Katu*	*Tikshna Laghu*	*Madhura*	*Anushna*
4.	*Kushtha*	*Saussurea lappa*	*Tikta Kaṭu*	*Laghu Ruksha*	*Katu*	*Ushna*
5.	*Sarshapa*	*Brassica nigra*	*Katu Tikta*	*Tikshna Snigdha*	*Katu*	*Ushna*
6.	*Vacha*	*Acorus calamus*	*Katu Tikta*	*Laghu Tikshna*	*Katu*	*Ushna*
7.	*Vatsakaphala*	Seed of *Holarrhena antidysenterica*	*Katu Tikta*	*Laghu Ruksha*	*Katu*	*Shita*
8.	*Shatapushpa*	*Anethum sowa*	*Katu Tikta*	*Laghu Snigdha*	*Katu*	*Ushna*
9.	*Madhuka*	*Glycyrrhiza glabra*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
10.	*Madanaphala*	*Randia dumetorum*	*Tikta Madhura*	*Laghu Ruksha*	*Katu*	*Ushna*

Application: Plants mentioned in this *Varga* can help in proper conduction of *Asthapana Basti* (Enema with decoction) once it is used with main *Asthapana Dravya.*

26. *Anuvasanopaga Mahakashaya Varga* (Adjuvants of *Anuvasana Basti*)

अनुवासनोपग - अनुवासन द्रव्यस्य तैलादनुवासनक्रियायां सहायत्वेनोपगच्छतीत्त्य-नुवासनोपगम्। (चक्रपाणि-च. सू. 4/8)

That which are used as adjuvants to *Anuvasana Basti.*

रास्नासुरदारुबिल्वमदनशतपुष्पावृश्चीरपुनर्नवाश्वदंष्ट्राग्निमन्थश्योनाका इति दशेमानि अनुवासनोपगानि भवन्ति । च. सू. 4/13

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Rasna*	*Pluchea lanceolata*	*Tikta*	*Guru*	*Katu*	*Ushna*
2.	*Suradaru*	*Cedrus deodara*	*Tikta Katu*	*Snighdha Laghu*	*Katu*	*Ushna*
3.	*Bilva*	*Aegle marmelos*	*Tikta*	*Laghu Ruksha*	*Katu*	*Ushna*
4.	*Madana*	*Randia dumetorum*	*Tikta Madhura*	*Laghu Ruksha*	*Katu*	*Ushna*
5.	*Shatapushpa*	*Anethum sowa*	*Katu Tikta*	*Laghu Snigdha*	*Katu*	*Ushna*
6.	*Vraschira*	*Trianthema portulacastrum*	*Katu*	*Laghu Ruksha*	*Katu*	*Ushna*
7.	*Punarnava*	*Boerhavia diffusa*	*Tikta*	*Laghu Ruksha*	*Katu*	*Shita*
8.	*Shwadam-shtra*	*Tribulus terestris*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
9.	*Agnimantha*	*Premna mucronata*	*Katu Tikta*	*Laghu Ruksha*	*Katu*	*Ushna*
10.	*Shyonaka*	*Oroxylum indicum*	*Tikta Kashaya*	*Laghu Ruksha*	*Katu*	*Ushna*

Application: Plants mentioned in this *Varga* can help in proper conduction of *Anuvasana Basti* (Enema with Oil) once it is used with main *Anuvasana Dravya.*

27. *Shirovirechanopaga Mahakashaya Varga* (Adjuvants of *Nasya*)

शिरोविरेचनोपग - शिरोविरेचनोपगे तु शिरोविरेचन प्रधान्येव द्रव्याणि बोद्धव्यानि ।

(चक्रपाणि-च. सू. 4/8)

That which are useful for *Shirovirecana kriya.*

ज्योतिष्मतीक्षवकमरिचपिप्पलीविडङ्गशिग्रुसर्षपापमार्गतण्डुलश्वेतामहाश्वेता इति दशेमानि शिरोविरेचनोपगानि भवन्ति । च. सू. 4/13

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Jyotishmati*	*Celastrus paniculatus*	*Katu Tikta*	*Tikshna Snigdha*	*Katu*	*Ushna*
2.	*Kshavaka*	*Centipeda orbicularis*	*Katu*	*Tikshna Laghu*	*Katu*	*Ushna*
3.	*Maricha*	*Piper nigrum*	*Katu*	*Tikshna Laghu*	*Katu*	*Ushna*

4.	*Pippali*	*Piper longum*	*Katu*	*Tikshna Laghu*	*Madhura*	*Anush-na*
5.	*Vidanga*	*Embelia ribes*	*Katu Kashaya*	*Laghu Ruksha*	*Katu*	*Ushna*
6.	*Shigru*	*Moringa oleifera*	*Katu*	*Ruksha Tikshna*	*Katu*	*Ushna*
7.	*Sarshapa*	*Brassica nigra*	*Katu Tikta*	*Tikshna Snigdha*	*Katu*	*Ushna*
8.	*Apamarga Tandula*	Seeds of *Achyran-thes aspera*	*Madhura*	*Ruksha*	*Madhura*	*Shita*
9.	*Shweta*	*Clitoria turnatea*	*Tikta Kashaya*	*Laghu Ruksha*	*Katu*	*Shita*
10.	*Mahashweta*	*Clitoria ternatea*	*Tikta Kashaya*	*Laghu Ruksha*	*Katu*	*Shita*

Application: Plants mentioned in this *Varga* can help in proper conduction of *Nasya Karma* (Instillation therapy) once it is used with main *Nasya Dravya*

28. *Chardinigrahana Mahakashaya Varga* (Anti-emetics)

छर्दिनिग्रहण – छर्दिनिगृह्णाति स्तम्भयतीति छर्दिनिग्रहणं व्याधिहरण वचनेन तद्धेतु दोषहरणामपि लभ्यते, रावं पत्रादि । (गंगाधर-च. सू. 4/8)

That which mitigates the causative factor for *Vamana* and thus alleviates *Chardi.*

जम्बवाम्रपल्लवमातुलुङ्गाम्लबदरदाडिमयवषष्टिकोशीर मृल्लाजा इति दशेमानि छर्दिनिग्रहणानि भवन्ति । च. सू. 4/14

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Jambupallava*	*Eugenia jambolana-* tender leaves	*Kashaya*	*Laghu Ruksha*	*Katu*	*Shita*
2.	*Amrapallava*	*Mangifera indica-* tender leaves	*Kashaya*	*Laghu Ruksha*	*Katu*	*Shita*
3.	*Matulunga*	*Citrus medica*	*Madhura*	*Laghu Snigdha*	*Madhura*	*Shita*
4.	*Amlabadara*	*Zizyphus jujuba*	*Madhura, Amla Kashaya*	*Picchila Guru*	*Madhura*	*Shita*
5.	*Dadima*	*Punica granatum*	*Madhura Kashaya*	*Laghu Snigdha*	*Madhura*	*Anu-shna*

6.	*Yava*	*Hordeum vulgare*	*Kashaya*	*Laghu Ruksha*	*Katu*	*Shita*
7.	*Yashtika*	*Glycyrrhiza glabra*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
8.	*Ushira*	*Vetiveria zizanoides*	*Tikta Madhura*	*Laghu Snigdha*	*Madhura*	*Shita*
9.	*Mrat*	Mud	*Kashaya*	*Laghu*	*Katu*	*Shita*
10.	*Laja*	Parched grains	*Madhura*	*Laghu*	*Madhura*	*Shita*

Application: Plants mentioned in this *Varga* are useful in case of *Chardi* (Vomiting).

29. *Trashnanigrahana Mahakashaya Varga* (Antidypsic)

तृष्णानिग्रहण - तृष्णां निगृह्णति स्तम्भयतीति तृष्णा निग्रहणम् । (गंगाधर-च. सू. 4/8)

That which mitigates the causative factors for *Trishna* & thus reduce *Trishna*.

नागरधन्वयासकमुस्तपर्पटकचन्दनकिराततिक्तगुडूचीह्रीबेरधान्यकपटोलानीति दशेमानि तृष्णानिग्रहणानि भवन्ति । (च. सू. 4/14)

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Nagara*	*Zingiber officinale*	*Katu*	*Laghu Snigdha*	*Madhura*	*Ushna*
2.	*Dhanvayasaka*	*Fagonia critica*	*Kashaya Tikta*	*Laghu Snigdha*	*Madhura*	*Shita*
3.	*Musta*	*Cyperus rotundus*	*Tikta Kashaya*	*Laghu Ruksha*	*Katu*	*Shita*
4.	*Parpataka*	*Fumaria parviflora*	*Tikta*	*Laghu*	*Katu*	*Shita*
5.	*Chandana*	*Santalam album*	*Tikta Madhura*	*Ruksha Laghu*	*Katu*	*Shita*
6.	*Kiratatikta*	*Swertia chirata*	*Tikta*	*Laghu Ruksha*	*Katu*	*Shita*
7.	*Guduchi*	*Tinospora cordifolia*	*Tikta Kashaya*	*Guru Snigdha*	*Madhura*	*Ushna*
8.	*Hrivera*	*Pavonia odorata*	*Kashaya Tikta*	*Laghu Snigdha*	*Madhura*	*Shita*
9	*Dhanyaka*	*Coriandrum sativum*	*Tikta Kashaya*	*Laghu Snigdha*	*Madhura*	*Ushna*
10.	*Patola*	*Tricosanthes dioica*	*Tikta*	*Laghu Snigdha*	*Katu*	*Ushna*

Application: Plants mentioned in this *Varga* are useful in case of *Trashna* (Thirst).

30. ***Hikkanigrahana Mahakashaya Varga*** **(Anti-hiccough)**

हिक्कानिग्रहण - हिक्कां निग्रह्णति स्तम्भयती हिक्कानिग्रहणम् । (गंगाधर-च. सू. 4/8)

That which relieves the causative factors for *Hikka* and thus cures *Hikka.*

शटीपुष्करमूलबदरबीजकण्टकारिकबृहतीवृक्षरुह्लोभयापिप्पलीदुरालभा कुलीरशृङ्ग्य इति दशेमानि हिक्कानिग्रहणानि भवन्ति । च. सू. 4/14

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Shati*	*Hedychium spicatum*	*Katu Tikta*	*Laghu Tikshna*	*Katu*	*Ushna*
2.	*Pushkara-mula*	*Inula racemosa*	*Katu Tikta*	*Tikshna Laghu*	*Katu*	*Ushna*
3.	*Badarabija*	Seeds of *Zizyphus jujuba*	*Kashaya*	*Laghu Ruksha*	*Katu*	*Ushna*
4.	*Kantakarika*	*Solanum xanthoc-arpum*	*Tikta Katu*	*Laghu Ruksha*	*Katu*	*Ushna*
5.	*Brahati*	*Solanum indicum*	*Katu Tikta*	*Laghu Ruksha*	*Katu*	*Ushna*
6.	*Vraksharuha*	*Loranthus longiflora*	*Katu Tikta*	*Laghu Ruksha*	*Katu*	*Ushna*
7.	*Abhaya*	*Terminalia chebula*	*Kashaya pradhana Pancarasa*	*Laghu Ruksha*	*Madhura*	*Ushna*
8.	*Pippali*	*Piper longum*	*Katu*	*Tikshna Laghu*	*Madhura*	*Anus-hna*
9.	*Duralabha*	*Fagonia critica*	*Kashaya Tikta*	*Laghu Snigdha*	*Madhura*	*Shita*
10.	*Kulirashrangi*	*Pistacia integerrima*	*Kashaya Tikta*	*Laghu Ruksha*	*Katu*	*Ushna*

Application: Plants mentioned in this *Varga* are useful in case of *Hikka* (Hiccough).

31. ***Purisha Sangrahaniya Mahakashaya Varga*** **(Bowel binders)**

पुरीषसंग्रहणीय - पुरीष संग्रहणं पुरीषस्य स्तम्भन, तस्मै हितम् । (गंगाधर-च. सू. 4/8)

That which restrains the movement of *Purisha*

प्रियङ्ग्वनन्ताम्रास्थिकटवङ्गलोध्रमोचरससमङ्गाधातकीपुष्पपद्मापद्मकेशराणीति दशेमानि पुरीषसंग्रहणीयानि भवन्ति । च. सू. 4/15

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Priyangu*	*Callicarpa macrophyllum*	*Tikta Kashaya*	*Guru Ruksha*	*Katu*	*Shita*
2.	*Ananta*	*Hemidesmus indicus*	*Tikta Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
3.	*Amrasthi*	*Mangifera indica*-seed coat	*Kashaya*	*Laghu Ruksha*	*Katu*	*Shita*
4.	*Katvanga*	*Oroxylum indicum*	*Tikta Kashaya*	*Laghu Ruksha*	*Katu*	*Ushna*
5.	*Lodhra*	*Symplocos racemosa*	*Kashaya*	*Ruksha*	*Katu*	*Shita*
6.	*Mocharasa*	Resin of *Salmalia malabarica*	*Kashaya*	*Laghu Picchila*	*Katu*	*Shita*
7.	*Samanga*	*Mimosa pudica*	*Tikta Kashaya*	*Laghu Ruksha*	*Katu*	*Shita*
8.	*Dhatakipushpa*	*Woodfordia floribunda*	*Kashaya Kaṭu*	*Laghu Ruksha*	*Katu*	*Shita*
9.	*Padma*	*Clerodendron serratum*	*Katu Tikta*	*Ruksha Laghu*	*Katu*	*Ushna*
10.	*Padmakeshara*	*Nelumbo nucifera*	*Kashaya Madhura Tikta*	*Laghu Snigdha*	*Madhura*	*Shita*

Application: Plants mentioned in this *Varga* are useful in case of *Atisara* (Diarrhoea).

32. *Purishavirajaniya Mahakashaya Varga* (Bowel normalizers)

पुरीषविरजनीय - पुरीषस्य विरजनं दोषसम्बन्धनिरासं करोतिति पुरीषविरजनीयम् ।

(गंगाधर-च. सू. 4/8)

That which removes the causative factors for vitiated *Purisha* and thus restores the normal colour of *Purisha*.

जम्बुशल्लकीत्वक्कच्छुरामधूकशाल्मलीश्रीवेष्टकभृष्टमृत्पयस्योत्पलतिलकणा इति दशेमानि पुरीषविरजनीयानि भवन्ति । च. सू. 4/15

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Priyangu*	*Callicarpa macrophyllum*	*Tikta Kashaya*	*Guru Ruksha*	*Katu*	*Shita*
2.	*Ananta*	*Hemidesmus indicus*	*Tikta Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
3.	*Amrasthi*	*Mangifera indica*-seed coat	*Kashaya*	*Laghu Ruksha*	*Katu*	*Shita*
4.	*Katvanga*	*Oroxylum indicum*	*Tikta Kashaya*	*Laghu Ruksha*	*Katu*	*Ushna*
5.	*Lodhra*	*Symplocos racemosa*	*Kashaya*	*Ruksha*	*Katu*	*Shita*
6.	*Mocharasa*	Resin of *Salmalia malabarica*	*Kashaya*	*Laghu Picchila*	*Katu*	*Shita*
7.	*Samanga*	*Mimosa pudica*	*Tikta Kashaya*	*Laghu Ruksha*	*Katu*	*Shita*
8.	*Dhatakipushpa*	*Woodfordia floribunda*	*Kashaya Kaṭu*	*Laghu Ruksha*	*Katu*	*Shita*
9.	*Padma*	*Clerodendron serratum*	*Katu Tikta*	*Ruksha Laghu*	*Katu*	*Ushna*
10.	*Padmakeshara*	*Nelumbo nucifera*	*Kashaya Madhura Tikta*	*Laghu Snigdha*	*Madhura*	*Shita*

Application: Plants mentioned in this *Varga* are useful in case of *Atisara* (Diarrhoea).

32. *Purishavirajaniya Mahakashaya Varga* (Bowel normalizers)

पुरीषविरजनीय - पुरीषस्य विरजनं दोषसम्बन्धनिरासं करोतिति पुरीषविरजनीयम् ।

(गंगाधर-च. सू. 4/8)

That which removes the causative factors for vitiated *Purisha* and thus restores the normal colour of *Purisha.*

जम्बुशल्लकीत्वक्कच्छुरामधूकशाल्मलीश्रीवेष्टकभृष्टमृत्पयस्योत्पलतिलकणा इति दशेमानि पुरीषविरजनीयानि भवन्ति । च. सू. 4/15

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Jambu twak*	Bark of *Eugenia jambolana*	*Kashaya*	*Laghu Ruksha*	*Katu*	*Shita*
2.	*Shallaki twak*	Bark of *Boswellia serrata*	Katu	*Laghu Ruksha*	*Katu*	*Ushna*
3.	*Kacchura*	*Mucuna pruriens*	*Madhura Tikta*	*Guru Snigdha*	*Madhura*	*Ushna*
4.	*Madhuka*	*Madhuca indica*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
5.	*Shalmali*	*Salmalia malabarica*	*Kashaya*	*Laghu Picchila*	*Katu*	*Shita*
6.	*Shriveshtaka*	*Pinus roxburghi*	*Katu Tikta*	*Laghu Snigdha*	*Katu*	*Ushna*
7.	*Bhrashtamrat*	*Fried mud*	*Kashaya*	*Laghu*	*Katu*	*Shita*
8.	*Payasya*	*Ipomoea digitata*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
9.	*Utpala*	*Nelumbo nucifera*	*Kashaya Madhura Tikta*	*Laghu Snigdha*	*Madhura*	*Shita*
10.	*Tilakana*	*Sesamum indicum*	*Madhura Kashaya*	*Guru snigdha*	*Katu*	*Ushna*

Application: Plants included in this Varga if used will bring back normal colour of faeces.

33. *Mutrasangrahaniya Mahakashaya Varga* (Antidiuretics)

मूत्रसंग्रहणीय - अतिमात्रं पुनः पुनश्च प्रवर्तमानं मूत्रं संगृहणतीति मूत्र संग्रहणीयम् ।

(गंगाधर-च. सू. 4/8)

That which reduces frequent micturition and thus normalizes *Mutra Pravrutti.*

जम्बवाम्लप्लक्षवटकपीतनोदुम्बराश्वत्थभल्लातकाश्मन्तकसोमवल्का इति दशेमानि मूत्रसंग्रहणीयानि भवन्ति । च. सू. 4/15

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Jambu*	*Eugenia jambolana*	*Kashaya Madhura*	*Laghu Ruksha*	*Katu*	*Shita*
2.	*Amra*	*Mangifera indica*	*Kashaya Madhura*	*Laghu Ruksha*	*Katu*	*Shita*
3.	*Plaksha*	*Ficus lacor*	*Kashaya*	*Guru Ruksha*	*Katu*	*Shita*
4.	*Vata*	*Ficus benghalensis*	*Kashaya*	*Guru Ruksha*	*Katu*	*Shita*

5.	*Kapitana*	*Albizzia lebbeck*	*Kashaya Tikta Madhura*	*Laghu Ruksha Tikshna*	*Katu*	*Anu-shna*
6.	*Udumbara*	*Ficus glomerata*	*Kashaya*	*Guru Ruksha*	*Katu*	*Ushna*
7	*Ashwattha*	*Ficus religiosa*	*Kashaya Madhura*	*Guru Ruksha*	*Katu*	*Shita*
8.	*Bhallataka*	*Semecarpus anacardium*	*Katu Madhura*	*Laghu Snigdha*	*Madhura*	*Ushna*
9.	*Ashmantaka*	*Ficus rumphi*	*Tikta Kashaya*	*Laghu Ruksha*	*Katu*	*Shita*
10.	*Somavalka*	*Acacia catechu*	*Tikta Kashaya*	*Laghu Ruksha*	*Katu*	*Shita*

Application: Plants mentioned in this *Varga* are useful in *Prameha* and *Madhumeha* (Diabetes mellitus).

34. *Mutravirajaniya Mahakashaya Varga* (Urine normalisers)

मूत्रविरजनीय - रावं मूत्र विरजनीयोऽपि व्याख्येयम् । मूत्रं विरजयति दोषसंबधनिरासं कृत्वा प्रकृतौ स्थापयतीति मूत्रविरजनीयम् । (चक्रपाणि-च. सू. 4/2)

That which removes the vitiation from *Mutra* and thus normalizes urine colour.

पद्मोत्पलनलिनकुमुदसौगन्धिक पुण्डरीकशतपत्र मधुकप्रियङ्गुधातकीपुष्पाणीति दशेमानि मूत्रविरजनीयानि भवन्ति । च. सू. 4/15

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Padma*	*Nelumbo nucifera*	*Kashaya Madhura Tikta*	*Laghu Snigdha*	*Madhura*	*Shita*
2.	*Utpala*	*Nelumbium speciosum*	*Kashaya Madhura Tikta*	*Laghu Snigdha*	*Madhura*	*Shita*
3.	*Nalina*	*Nelumbo* Sp	*Kashaya Madhura Tikta*	*Laghu Snigdha*	*Madhura*	*Shita*
4.	*Kumuda*	*Nymphaea* alba	*Kashaya Madhura Tikta*	*Laghu Snigdha*	*Madhura*	*Shita*

5.	*Saugandhika*	*Nymphaea* Sp	*Kashaya Madhura Tikta*	*Laghu Snigdha*	*Madhura*	*Shita*
6.	*Pundarika*	*Nelumbo* Sp	*Kashaya Madhura Tikta*	*Laghu Snigdha*	*Madhura*	*Shita*
7.	*Shatapatra*	*Nelumbo* Sp	*Kashaya Madhura Tikta*	*Laghu Snigdha*	*Madhura*	*Shita*
8.	*Madhuka*	*Glycyrrhiza glabra*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
9.	*Priyangu*	*Callicarpa macrophylla*	*Tikta kashaya*	*Guru Ruksha*	*Katu*	*Shita*
10.	*Dhatakipushpa*	*Woodfordia floribunda* flowers	*Kashaya Katu*	*Laghu Ruksha*	*Katu*	*Shita*

Application: The plants mentioned in this *Varga* if used will bring back normal colour to the urine.

35. *Mutravirechaniya Mahakashaya varga* (Diuretics)

मूत्रविरेचनीय (मूत्रल) - मूत्रस्य विरेचनं करोतीति मूत्रविरेचनीयम् । (चक्रपाणि- च. सू. 4/8)

That which expels urine.

वृक्षादनीश्वदंष्ट्रावसुकवशीरपाषाणभेद दर्भकुशकाशगुन्द्रेत्कटमूलानीति दशेमानि मूत्रविरेचनीयानि भवन्ति । च. सू. 4/15

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Vrakshdani*	*Loranthus longiflora*	*Katu Tikta*	*Laghu Ruksha*	*Katu*	*Ushna*
2.	*Shwadamshtra*	*Tribulus terrestris*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
3.	*Vasuka*	*Trianthema portulacastrum*	*Katu*	*Laghu Ruksha*	*Katu*	*Ushna*
4.	*Vashira*	*Achyranthes bidentata*	*Tikta Katu*	*Sara, Tikshna*	*Katu*	*Ushna*
5.	*Pashanabheda*	*Berginia ligulata*	*Kashaya Tikta*	*Tikshna Snigdha*	*Katu*	*Shita*
6.	*Darbha*	*Imperata cylindrica*	*Madhura*	*Laghu Snigdha*	*Madhura*	*Shita*
7.	*Kusha*	*Desmostachya bipinnata*	*Madhura Kashaya*	*Laghu Snigdha*	*Madhura*	*Shita*

8.	*Kasha*	*Saccharum spontaneum*	*Madhura Tikta*	*Laghu Snigdha*	*Madhura*	*Shita*
9.	*Gundra*	*Typha angustata*	*Madhura Tikta*	*Laghu Snigdha*	*Madhura*	*Shita*
10.	*Itkatamula*	*Typha elephentina*	*Madhura Tikta*	*Laghu Snigdha*	*Madhura*	*Shita*

Application: Plants of this *Varga* can be used as diuretic and useful in dysuria and smaller urinary calculi.

36. *Kasahara Mahakashaya Varga* (Anti-tussives)

खासहर - कासं हरतीति कासहरम् ।

That which cures cough.

द्राक्षाभयामलकपिप्पलीदुरालभाशृङ्गीकण्टकारिकावृश्चीरपुनर्नवातामलक्य इति दशेमानि कासहराणि भवन्ति । च. सू. 4/16

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Draksha*	*Vitis vinifera*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
2.	*Abhaya*	*Terminalia chebula*	*Kashaya pradhana Pancarasa*	*Laghu Ruksha*	*Madhura*	*Ushna*
3.	*Amalaka*	*Emblica officinalis*	*Amlapra-dhana*	*Ruksha Laghu*	*Madhura*	*Shita*
4.	*Pippali*	*Piper longum*	*Katu*	*Tikshna Laghu*	*Madhura*	*Anus-hna*
5.	*Duralabha*	*Fagonia critica*	*Kashaya Tikta*	*Laghu Snigdha*	*Madhura*	*Shita*
6.	*Shrangi*	*Pistacia integerrima*	*Kashaya Tikta*	*Laghu Ruksha*	*Katu*	*Ushna*
7.	*Kantakarika*	*Solanum xanthoca-rpum*	*Kashaya Tikta*	*Laghu Ruksha*	*Katu*	*Ushna*
8.	*Vrashchira*	White variety of *Boerhavia diffusa*	*Tikta*	*Laghu Ruksha*	*Katu*	*Shita*
9.	*Punarnava*	*Boerhavia diffusa*	*Tikta*	*Laghu Ruksha*	*Katu*	*Shita*
10.	*Tamalaki*	*Phyllanthus amarus*	*Tikta Kashaya Madhura*	*Laghu Ruksha*	*Madhura*	*Shita*

Application: Plants mentioned in this *Varga* are useful in case of *Kasa* (cough).

37. *Shwasahara Mahakashaya Varga* (Anti-dyspnetic)

इवासहर - श्वासं श्वासरोगं हरतीति श्वासहरम् ।

That which is beneficial in *Shwasaroga*

शटीपुष्करमूलाम्लवेतसैलाहिङ्ग्वगुरुसुरसातामलकीजीवन्ती चण्डा इति दशेमानि श्वासहराणि भवन्ति । च. सू. 4/16

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Shati*	*Hedychium spicatum*	*Katu Tikta*	*Laghu Tikshna*	*Katu*	*Ushna*
2.	*Pushkaramula*	*Inula racemosa*	*Katu Tikta*	*Tikshna Laghu*	*Katu*	*Ushna*
3.	*Amlavetasa*	*Garcinia pedunculata*	*Madhura*	*Laghu Ruksha*	*Amla*	*Ushna*
4.	*Ela*	*Elattaria cardamomum*	*Kaṭu Madhura*	*Laghu Ruksha*	*Madhura*	*Shita*
5.	*Hingu*	*Ferula narthex*	*KatuTikta*	*Laghu Tikshna*	*Katu*	*Ushna*
6.	*Agaru*	*Aquilaria agallocha*	*Katu Tikta*	*Tikshna Laghu*	*Katu*	*Ushna*
7.	*Surasa*	*Ocimum sanctum*	*Katu Tikta*	*Laghu Ruksha*	*Katu*	*Ushna*
8.	*Tamalaki*	*Phyllanthus amarus*	*Tikta Kashaya Madhura*	*Laghu Ruksha*	*Madhura*	*Shita*
9.	*Jivanti*	*Leptadenia reticulata*	*Madhura*	*Laghu Snigdha*	*Madhura*	*Shita*
10.	*Canda*	*Angelica glauca*	*Katu Tikta*	*Tikshna Laghu*	*Katu*	*Ushna*

Application: Plants mentioned in this *Varga* are useful in case of *Shwasa* (Difficulty in breathing).

38. *Shwayathuhara Mahakashaya Varga* (Anti-inflammatory)

शोथहर (श्वयथुहर) - शोथं हरतीति शोथहरम् ।

That which reduces swelling.

पाटलाग्निमन्थश्योनाकबिल्वकाश्मर्यकण्टकारिकाबृहतीशालपर्णीपृश्निपर्णी गोक्षुरका इति दशेमानि श्वयथुहराणि, भवन्ति । च. सू. 4/16

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Patala*	*Stereospermum suaveolens*	*Tikta Kashaya*	*Laghu Ruksha*	*Katu*	*Ushna*

2.	*Agnimantha*	*Premna mucronata*	*Katu Tikta*	*Laghu Ruksha*	*Katu*	*Ushna*
3.	*Shyonaka*	*Oroxylum indicum*	*Tikta Kashaya*	*Laghu Ruksha*	*Katu*	*Ushna*
4.	*Bilva*	*Aegle marmelos*	*Tikta*	*Laghu Ruksha*	*Katu*	*Ushna*
5.	*Kashmarya*	*Gmelina arborea*	*Tikta Kashaya*	*Laghu Ruksha*	*Katu*	*Ushna*
6.	*Kantakarika*	*Solanum xanthocarpum*	*Tikta Katu*	*Laghu Ruksha*	*Katu*	*Ushna*
7.	*Brahati*	*Solanum indicum*	*Katu Tikta*	*Laghu Ruksha*	*Katu*	*Ushna*
8.	*Shalaparni*	*Desmodium gangeticum*	*Kashaya*	*Laghu Picchila*	*Katu*	*Shita*
9.	*Prashniparni*	*Uraria picta*	*Madhura Tikta*	*Laghu Sara*	*Madhura*	*Ushna*
10.	*Gokshuraka*	*Tribulus terrestris*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*

Application: Plants mentioned in this *Varga* are useful in case of *Shwayathu* (Inflammatory conditions).

39. *Jwarahara Mahakashaya Varga* (Antipyretics)

ज्वरहर - ज्वरं ज्वरसन्तापं हरतीति ज्वरहरम् ।

That which alleviates fever.

सारिवाशर्करापाठामञ्जिष्ठाद्राक्षापीलुपरुषकाभयामलकविभीतकानीति दशेमानि ज्वरहराणि भवन्ति । च. सू. 4/16

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Sariva*	*Hemidesmus indicus*	*Tikta Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
2.	*Sharkara*	Sugar	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
3.	*Patha*	*Cissampelos pareira*	*Tikta*	*Laghu Tikshna*	*Katu*	*Ushna*
4.	*Manjishtha*	*Rubia cordifolia*	*Kashaya Tikta*	*Guru Ruksha*	*Katu*	*Ushna*
5.	*Draksha*	*Vitis vinifera*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
6.	*Pilu*	*Salvadora persica*	*Tikta Madhura*	*Laghu snigdha*	*Katu*	*Ushna*
7.	*Parushaka*	*Grewia asiatica*	*Madhura, Amla, Kashaya*	*Laghu snigdha*	*Madhura*	*Shita*

8.	*Abhaya*	*Terminalia chebula*	*Kashaya pradhana Pancarasa*	*Laghu Ruksha*	*Madhura*	*Ushna*
9.	*Amalaka*	*Phyllanthus emblica*	*Amlapra-dhana*	*Ruksha Laghu*	*Madhura*	*Shita*
10.	*Vibhitaka*	*Terminalia belerica*	*Kashaya*	*Ruksha Laghu*	*Madhura*	*Ushna*

Application: Plants mentioned in this *Varga* are useful in case of *Jwara* (Fever).

40. *Shramahara Mahakashaya Varga* (Fatigue dispellers)

श्रमहर - श्रमंहरतीति श्रमहरम् ।

That which relieves tiredness.

द्राक्षाखर्जूरप्रियालबदरदाडिमफल्गुपरुषकेक्षुयवषष्टिका इति दशेमानि श्रमहराणि भवन्ति ।

च. सू. 4/16

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Draksha*	*Vitis vinifera*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
2.	*Kharjura*	*Phoenix sylvestris*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
3.	*Priyala*	*Buchanania lanzan*	*Madhura*	*Snigdha Guru*	*Madhura*	*Shita*
4.	*Badara*	*Zizyphus jujuba*	*Madhura, Amla Kasshaya*	*Picchila Guru*	*Madhura*	*Shita*
5.	*Dadima*	*Punica granatum*	*Madhura Kashaya*	*Laghu Snigdha*	*Madhura*	*Anushna*
6.	*Phalgu*	*Ficus carica*	*Madhura,*	*Laghu snigdha*	*Madhura*	*Shita*
7.	*Parushaka*	*Grewia asiatica*	*Madhura, Amla, Kashaya*	*Laghu snigdha*	*Madhura*	*Shita*
8.	*Ikshu*	*Saccharum officinarum*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
9.	*Yava*	*Hordeum vulgare*	*Kashaya Madhura*	*Ruksha*	*Katu*	*Shita*
10.	*Shashtika*	*Oryza sativa*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*

Application: Plants mentioned in this *Varga* are useful in case of *Shrama* (Fatigue).

41. *Dahaprashamana Mahakashaya Varga* (Coolant)

दाहप्रशमन - दाहं प्रशमयतीति दाहप्रशमनम् ।

That which mitigates internal and external burning sensation.

लाजाचन्दनकाश्मर्यफलमधूकशर्करानीलोत्पलोशीरसारिवगुडूचीह्रीबेराणीति दशेमानि दाहप्रशमनानि भवन्ति । च. सू. 4/17

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Laja*	Parched grain	*Madhura*	*Laghu Snigdha*	*Madhura*	*Shita*
2.	*Chandana*	*Santalum album*	*Tikta Madhura*	*Ruksha Laghu*	*Katu*	*Shita*
3.	*Kashmarya Phala*	Fruit of *Gmelina arboroea*	*Madhura Amla*	*Guru Snigdha*	*Madhura*	*Shita*
4.	*Madhuka*	*Madhuca indica*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
5.	*Sharkara*	Sugar	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
6.	*Nilotpala*	*Nymphea stellata*	*Kashaya Madhura Tikta*	*Laghu Snigdha*	*Madhura*	*Shita*
7.	*Ushira*	*Vetiveria zizanoides*	*Tikta Madhura*	*Laghu Snigdha*	*Madhura*	*Shita*
8.	*Sariva*	*Hemidesmus indicus*	*Tikta Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
9.	*Guduchi*	*Tinospora cordifolia*	*Tikta Kashaya*	*Guru Snigdha*	*Madhura*	*Ushna*
10.	*Hribera*	*Pavonia odorata*	*Tikta Madhura*	*Guru Snigdha*	*Madhura*	*Shita*

Application: Plants mentioned in this *Varga* are useful in case of *Daha* (Burning sensation).

42. *Shitaprashamana Mahakashaya Varga* (Calefacient)

शीतप्रशमन - शीतं प्रशमयतीति शीतप्रशमनम् ।

That which reduce the feeling of coldness & brings in warmth

तगरागुरुधान्यकशृङ्गवेरभूतीकवचाकण्टकार्यग्निमन्थश्योनाकपिप्पल्य इति दशेमानि शीतप्रशमानि भवन्ति । च. सू. 4/17

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Tagara*	*Valeriana wallichi*	*Tikta Katu*	*Laghu Snigdha*	*Katu*	*Ushna*
2.	*Aguru*	*Aquillaria agallocha*	*Katu Tikta*	*Tikshna Laghu*	*Katu*	*Ushna*
3.	*Dhanyaka*	*Coriandrum sativum*	*Tikta Kashaya*	*Laghu Snigdha*	*Madhura*	*Ushna*
4.	*Shringavera*	*Zingiber officinale*	*Katu*	*Tiksna Ruksha*	*Madhura*	*Ushna*
5.	*Bhutika*	*Trachyspermum ammi*	*Katu Tikta*	*Laghu Ruksha*	*Katu*	*Ushna*
6.	*Vacha*	*Acorus calamus*	*Kaṭu Tikta*	*Laghu Tikshna*	*Katu*	*Ushna*
7.	*Kantakari*	*Solanum xanthocarpum*	*Tikta Katu*	*Laghu Ruksha*	*Katu*	*Ushna*
8.	*Agnimantha*	*Premna mucronata*	*Katu Tikta*	*Laghu Ruksha*	*Katu*	*Ushna*
9.	*Shyonaka*	*Oroxylum indicum*	*Tikta Kashaya*	*Laghu Ruksha*	*Katu*	*Ushna*
10.	*Pippali*	*Piper longum*	*Katu*	*Tikshna Laghu*	*Madhura*	*Anushna*

Application: Plants mentioned in this *Varga* are useful in case of *Ati shita* (increased cold) as it increases temperature.

43. *Udardaprashamana Mahakashaya Varga* (Antiallergic)

उदर्द प्रशमन - उदर्दो वरटीदंष्ट्राकारः शोथः तत्प्रशमनं उदर्दप्रशमनम् । (चक्रपाणि-च. सू. 4/8)

That which relieves Udarda.

तिन्दुकप्रियालबदरखदिरकदरसप्तपर्णाश्वकर्णार्जुनासनारिमेदा इति दशेमानि उदर्दप्रशमनानि भवन्ति । च. सू. 4/17

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Tinduka*	*Diospyros embryopteris*	*Tikta Kashaya*	*Laghu Ruksha*	*Katu*	*Shita*
2.	*Priyala*	*Buchanania lanzan*	*Madhura*	*Snigdha Guru*	*Madhura*	*Shita*
3.	*Badara*	*Zizyphus jujuba*	*Madhura, Amla Kashaya*	*Picchila Guru*	*Madhura*	*Shita*
4.	*Khadira*	*Acacia catechu*	*Tikta Kashaya*	*Laghu Ruksha*	*Katu*	*Shita*

5.	*Kadara*	*Acacia suma*	*Tikta Kashaya*	*Laghu Ruksha*	*Katu*	*Shita*
6.	*Saptaparna*	*Alstonia scholaris*	*Tikta Kashaya*	*Laghu Snigdha*	*Katu*	*Ushna*
7.	*Ashwakarna*	*Dipterocarpus alatus*	*Kashaya*	*Laghu Ruksha*	*Katu*	*Shita*
8.	*Arjuna*	*Terminalia arjuna*	*Kashaya*	*Laghu Ruksha*	*Katu*	*Shita*
9.	*Asana*	*Pterocarpus marsupium*	*Kashaya*	*Ruksha Laghu*	*Katu*	*Ushna*
10.	*Arimeda*	*Acacia fernesiana Tikta*	*Kashaya*	*Laghu Tikshna*	*Katu*	*Ushna*

Application: Plants mentioned in this *Varga* are useful in case of *Udarda* (Allergic conditions).

44. *Angamardaprashamana Mahakashaya Varga* (Anti-malaise)

अङ्गमर्द - अङ्गमर्दं प्रशमयतीति अङ्गमर्दप्रशमनम् ।

That which alleviates body aches.

विदारीगन्धापृश्निपर्णीबृहतीकण्टकारिकैरण्डकाकोलीचन्दनोशीरैलामधुकानीति दशेमान्यङ्गमर्दप्रशमनानि भवन्ति । च.सू.4/17

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Vidarigandha*	*Desmodium gangeticum*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
2.	*Prashniparni*	*Uraria picta*	*Madhura Tikta*	*Laghu Sara*	*Madhura*	*Ushna*
3.	*Brahati*	*Solanum indicum*	*Kaṭu Tikta*	*Laghu Ruksha*	*Katu*	*Ushna*
4.	*Kantakarika*	*Solanum xanthocarpum*	*Tikta Katu*	*Laghu Ruksha*	*Katu*	*Ushna*
5.	*Eranda*	*Ricinus communis*	*Madhura Katu*	*Tikshna Snigdha*	*Madhura*	*Ushna*
6.	*Kakoli*	*Lillium polyphyllum*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
7.	*Chandana*	*Santalum album*	*Tikta Madhura*	*Ruksha Laghu*	*Katu*	*Shita*
8.	*Ushira*	*Vetiveria zizanoides*	*Tikta Madhura*	*Laghu Snigdha*	*Madhura*	*Shita*
9.	*Ela*	*Elattaria cardamomum*	*Katu Madhura*	*Laghu Ruksha*	*Madhura*	*Shita*
10.	*Madhuka*	*Glycyrrhiza glabra*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*

Application: Plants mentioned in this *Varga* are useful in case of *Angamardai* (Body ache).

45. *Shulaprashamana Mahakashaya Varga* (Anti spasmodics)

शूलप्रशमन - शूलं प्रशमयतीति शूलप्रशमनम् ।

That which cures abdominal pain.

पिप्पली पिप्पलीमूलचव्यचित्रकशृङ्गवेरमरिचाजमोदाजगन्धाजाजीगण्डीराणीति दशेमानि शूलप्रशमनानि भवन्ति । च.सू. 4/17

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Pippali*	*Piper longum*	*Katu*	*Tikshna Laghu*	*Madhura*	*Anushna*
2.	*Pippalimula*	Root of *Piper longum*	*Katu*	*Tikshna Laghu*	*Katu*	*Ushna*
3.	*Cavya*	*Piper chaba*	*Kashaya Katu*	*Laghu Ruksha*	*Katu*	*Ushna*
4.	*Citraka*	*Plumbago zeylanica*	*Katu*	*Tikshna*	*Katu*	*Ushna*
5.	*Shrangavera*	*Zingiber officinale*	*Katu*	*Laghu Snigdha*	*Madhura*	*Ushna*
6.	*Maricha*	*Piper nigrum*	*Katu*	*Tikshna Laghu*	*Katu*	*Ushna*
7.	*Ajamoda*	*Apium graveolens*	*Katu Tikta*	*Laghu Tikshna*	*Katu*	*Ushna*
8.	*Ajagandha*	*Gynandropsis pentaphylla*	*Katu*	*Ruksha Laghu*	*Katu*	*Ushna*
9.	*Ajaji*	*Cuminum cyminum*	*Katu*	*Ruksha Laghu*	*Katu*	*Ushna*
10.	*Gandira*	*Euphorbia* sp	*Katu*	*Ruksha Laghu*	*Katu*	*Ushna*

Application: Plants mentioned in this *Varga* are useful in case of *Shula* (Abdominal colic).

46. *Shonitasthapana Mahakashaya Varga* (Haemostatic)

शोणितस्थापन - शोणितस्य दुष्टस्य दुष्टिंमपहृत्य प्रकृतौ स्थापयतीति शोणितस्थापनम् ।

(चक्रपाणि- च. सू. 4/8)

शोणितस्थापनं शोणितातति प्रवृत्तिस्तम्भनम् । (डल्हण- सु. चि. 1/48)

That which removes the vitiation from the vitiated *Rakta* & restrains.

मधुमधुकरुधिरमोचरसमृत्कपाललोध्रगैरिकप्रियङ्गुशर्करालाजा इति दशेमानि शोणितस्थापनाति भवन्ति । च.सू. 4/18

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Madhu*	Honey	*Kashaya*	*Ruksha*	*Katu*	*Ushna*
2.	*Madhuka*	*Glycyrrhza glabra*	*Madhura*	*Guru Snigdha*	*Madhura*	*Shiṭa*
3.	*Rudhira*	*Crocus sativa*	*Katu Tikta*	*Snigdha Laghu*	*Katu*	*Ushna*
4.	*Mocharasa*	Resin of *Salmalia malabarica*	*Kashaya*	*Laghu Picchila*	*Katu*	*Shita*
5.	*Mratkapala*	Fried soil	*Kashaya*	*Ruksha*	*Katu*	*Shita*
6.	*Lodhra*	*Symplocos racemosa*	*Kashaya*	*Ruksha*	*Katu*	*Shita*
7.	*Gairika*	Red ochre	*Kashaya*	*Ruksha*	*Katu*	*Shita*
8.	*Priyangu*	*Callicarpa macrophylla*	*Tikta Kashaya*	*Guru Ruksha*	*Katu*	*Shita*
9.	*Sharkara*	Sugar	*Madhura*	*Guru Snigdha*	*Madhura*	*Shita*
10.	*Laja*	Parched rice	*Madhura*	*Laghu Snigdha*	*Madhura*	*Shita*

Application: Plants mentioned in this *Varga* are useful in case of *Shonita Pravratti* / *Raktasrava* (bleedin conditions) as they can stop bleeding.

47. *Vedanasthaapna Mahakashaya Varga* (Anodynes)

वेदनास्थापन - वेदनायां संभूतायां तां निहन्त्य शरीरं प्रकृतौ स्थापयतीति वेदनास्थापनम् ।

(चक्रपाणि-च. सू. 4/8)

That which relieves Vedana and brings the body to its normal condition.

शालकट्फलकदम्बपद्मकतुम्बमोचरसशिरीषवञ्जुलैलवालुकाशोका इति दशेमानि वेदनास्थापनानि भवन्ति । च. सू. 4/18

Sl No	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Shala*	*Shorea robusta*	*Kashaya madhura*	*Ruksha*	*Katu*	*Shita*
2.	*Katphala*	*Myrica nagi*	*Kashaya Tikta Kaṭu*	*Laghu Tikshna*	*Katu*	*Ushna*
3.	*Kadamba*	*Anthocephalus cadamba*	*Madhura Tikta Kashaya*	*Ruksha*	*Katu*	*Shita*
4.	*Padmaka*	*Prunus cerasoides*	*Kashaya Tikta*	*Laghu Snigdha*	*Katu*	*Shita*
5.	*Tumba*	*Xanthoxylum armatum*	*Katu*	*Laghu Tikshna*	*Katu*	*Ushna*

6.	*Mocharasa*	Resin of *Salmalia*	*Kashaya malabarica*	*Laghu Picchila*	*Katu*	*Shita*
7.	*Shirisha*	*Albizzia labback*	*Kashaya Tikta*	*Laghu Ruksha*	*Katu*	*Anushna*
8.	*Vanjula*	*Salix caprea*	*Kashaya Tikta*	*Laghu Ruksha*	*Katu*	*Shita*
9.	*Elavaluka*	*Prunus cerasus*	*Kashaya Tikta*	*Laghu Ruksha*	*Katu*	*Shita*
10.	*Ashoka*	*Saraca asoca*	*Kashaya Tikta*	*Laghu Ruksha*	*Katu*	*Shita*

Application: Plants mentioned in this *Varga* are useful in case of *Vedanai* (discomfort) as they will correct the pathology.

48. *Sanjnasthapana Mahakashaya Varga* (Resuscitative)

संज्ञास्थापन - संज्ञा ज्ञानं स्थापयतीति संज्ञास्थापनम् । (चक्रपाणि-च. सू. 4/8)

That which restores *Jnana* or consciousness.

हिङ्गुकैटर्यारिमेदावचाचोरकवयस्थागोलोमीजटिलापलङ्कषाशोकरोहिण्य इति दशेमानि संज्ञास्थापनानि भवन्ति । च. सू. 4/18

Sl	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Hingu*	*Ferula narthex*	*Katu Tikta*	*Laghu Tikshna*	*Katu*	*Ushna*
2.	*Kaitarya*	*Myrica nagi?*	*Katu Tikta Tikta*	*Laghu Tikshna*	*Katu*	*Ushna*
3.	*Arimeda*	*Acacia fernesiana*	*Kashaya*	*Laghu Tikshna*	*Katu*	*Ushna*
4.	*Vacha*	*Acorus calamus*	*Katu Tikta*	*Laghu Tikshna*	*Katu*	*Ushna*
5.	*Coraka*	*Angelica glauca*	*KatuTikta*	*Laghu Tikshna*	*Katu*	*Ushna*
6.	*Vayastha*	*Bacopa monnieri*	*Tikta Kashaya*	*Laghu Sara*	*Madhura*	*Shita*
7.	*Golomi*	*Selinium tenuifolium*	*Katu Tikta*	*Laghu Tikshna*	*Katu*	*Ushna*
8.	*Jatila*	*Nardostachys jatamansi*	*Tikta Kashaya*	*Laghu Snigdha*	*Katu*	*Shita*
9.	*Plankasha*	*Commiphora mukul*	*Tikta Katu*	*Tikshna Snigdha*	*Katu*	*Ushna*
10.	*Ashokarohini*	*Picrorriza kurroa*	*Tikta*	*Ruksha Laghu*	*Katu*	*Shita*

Application: Plants mentioned in this *Varga* are useful in case of *Sanjna nasha* (loss of conciousness).

49. *Prajasthapana Mahakashaya Varga* (Fertility promoters)

प्रजास्थापन (गर्भस्थापन) - प्रजोपघातकं दोषं हत्वा प्रजां स्थापयीति प्रजास्थापनम् ।

(चक्रपाणि-च. सू. 4/8)

That which mitigates the destructive factor of fetus and thus retains *Garbha* (fetus).

रान्द्रीब्राह्मीशतवीर्यासहस्त्रवीर्याऽमोधाऽव्यथाशिवाऽरिष्टावाट्यपुष्पीविश्वक्सेन कान्ता इति दशेमानि प्रजास्थापनानि भवन्ति । च. सू. 4/18

Sl	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Aindri*	*Citrullus colocynthis*	*Tikta Katu*	*Laghu Sara*	*Katu*	*Ushna*
2.	*Brahmi*	*Bacopa monneiri*	*Tikta Kashaya*	*Laghu Sara*	*Madhura*	*Shita*
3.	*Shatavirya*	*Cynodon dactylon*	*Tikta Madhura*	*Laghu*	*Madhura*	*Shita*
4.	*Sahasravirya*	*Cynodom* Sp	*Tikta Madhura*	*Laghu*	*Madhura*	*Shita*
5.	*Amogha*	*Stereospermum suaveolens*	*Tikta Kashaya*	*Laghu Ruksha*	*Katu*	*Ushna*
6.	*Avyatha*	*Musa paradisica*	*Madhura Kashaya*	*Guru Snigdha*	*Madhura*	*Shita*
7.	*Shiva*	*Terminalia chebula*	*Kashaya pradhana Pancarasa*	*Laghu Ruksha*	*Madhura*	*Ushna*
8.	*Arishta*	*Picrorrhiza kurroa*	*Tikta*	*Ruksha Laghu*	*Katu*	*Shita*
9.	*Vatyapushpi*	*Sida cordifolia*	*Madhura*	*Snigdha Guru*	*Madhura*	*Shita*
10.	*Vishwakse-nakanta*	*Callicarpa macrophylla*	*Tikta Kashaya*	*Guru Ruksha*	*Katu*	*Shita*

Application: Plants mentioned in this *Varga* are useful in case of *Vandyatva* (infertility) as they correct the pathology which is responsible for infertility.

50. *Vayasthapana Mahakashaya Varga* (Longevity promoters)

वयःस्थापन - वयः तरुणं स्थापयतीति वयः स्थापनम् । (चक्रपाणि-च. सू. 4/8)

That which establishes youth.

अमृताऽभयाधात्रीमुक्ताश्वेताजीवन्त्यतिरसा मण्डूकपर्णी स्थिरा पुनर्नवा इति दशेमानि वयःस्थापनानि भवन्ति । च. सू. 4/18

Sl	Name	Botanical Name	*Rasa*	*Guna*	*Vipaka*	*Virya*
1.	*Amrata*	*Tinospora cordifolia*	*Tikta Kashaya*	*Guru Snigdha*	*Madhura*	*Ushna*
2.	*Abhaya*	*Terminalia chebula*	*Kashaya pradhana Pancarasa*	*Laghu Ruksha*	*Madhura*	*Ushna*
3.	*Dhatri*	*Emblica officinalis*	*Amlapradhana*	*Ruksha Laghu*	*Madhura*	*Shita*
4.	*Mukta*	*Pluchea lanceolata*	*Tikta*	*Guru*	*Katu*	*Ushna*
5.	*Shweta*	*Clitoria ternatea*	*Tikta Kashaya*	*Laghu Ruksha*	*Katu*	*Shita*
6.	*Jivanti*	*Leptadenia reticulata*	*Madhura*	*Laghu Snigdha*	*Madhura*	*Shita*
7.	*Atirasa*	*Asparagus racemosus*	*Kashaya Kaṭu*	*Guru Snigdha*	*Madhura*	*Shita*
8.	*Manduka-parni*	*Centella asiatica*	*Tikta Kashaya*	*Laghu Sara*	*Madhura*	*Shita*
9.	*Sthira*	*Desmodium gangeticum*	*Madhura Tikta*	*Gruru Snigdha*	*Madhura*	*Shita*
10.	*Punarnava*	*Boerharia diffusa*	*Tikta*	*Laghu Ruksha*	*Katu*	*Shita*

Application: The plants mentioned in this Varga are having the Rasayana property hence if used will stop the aging process.

Multiple Choice Questions (MCQ):

1. Number of Maha Kashaya Vargas mentioned by Acharya Charaka

   a. 25 b. 30 c. 50 d. 40

   Ans: c. 50

2. 50 Dashemani Varga are mentioned in

   a. Charaka Sutrasthana 8th Chapter b. Charaka Sutrsthana 4th Chapter
   c. Charaka Sutrasthana 12th Chapter d. Charaka Sutrasthana 16th Chapter

   Ans: b. Charaka Sutrasthana 4th Chapter

3. Number of Drugs mentioned in each Varga are

   a. 10 b. 20 c. 25 d. 30

   Ans: a. 10

4. First Varga among Dashemani Varga

   a. Brahmaniya b. Lekhaniya c. Sandhaniya d. Jivaniya

   Ans: d. Jivaniya

5. Bhallatakasthi and Hingu Niryasa are mentioned in
   a. Hradya b. Dipaniya c. Sandhaniya d. Brahmaniya
   Ans: b. Dipaniya
6. Sita & Lata are included under which Dashemani Varga
   a. Varnya b. Kanthya b. Balya d. Hradya
   Ans: a. Varnya
7. Hradya Dashemani Varga contains which Rasayukta Dravya
   a. Madhura b. Katu c. Amla d. Kashaya
   Ans: c. Amla
8. Kebuka is included under
   a. Kushthaghna b. Krimighna c. Jwarghna d. Kandughna
   Ans: b. Krimighna
9. Different types of Kamala are included in
   a. Mutravirechaniya b. Mutra Sangrahaniya
   c. Mutra Vitajaniya d. Purisha Virajaniya
   Ans: c) Mutra Virajaniya
10. Arjuna is included under
    a. Udarda Prashamana b. Shita Prashamana
    c. Vayasthapana d. Sanjnasthapana
    Ans: a) Udarda Prashamana

*****

11 Chapter

Principles of General Pharmacology

Contents:

Introduction to Pharmacology
Drug definition
Drug Nomenclature
Drug dosage forms
Pharmacokinetics
Bioavailability
Distribution
Excretion
Pharmacodynamics
Synergism
Factors modifying drug action
Pharmacovigilance
General anesthetics
Tranquilizers
Hypnotics
Anti parkinsonian
Anti anxiety
Autacoids
Non steroidal anti-inflammatory drugs (NSAID)
Antipyretic
Aerosols/Inhalants
Antitussive
Anti anginal
Anti diuretics
Haemopoetic
Styptics
Hypolipidemic drugs
Carminatives
Antacids
Laxatives
Hepatoprotective
Definition of Pharmacology
Historical Development of Drug
Nature & Sources of Drugs
Routes of Drug Administration
Absorption
Bioequivalence
Metabolism
Kinetics of Drug Elimination
Mechanism of Drug action
Drug Dose
Adverse Drug Effects
A brief review on Central Nervous System
CNS depressants
Sedative
Antiepileptic
Antidepressants
Analgesic
Antihistaminics
Anti-inflammatory
Bronchodilators
Expectorants
Antihypertensive
Diuretic
Lithotriptic
Coagulants
Anticoagulants
Digestants
Antiulcer
Antiemetic
Antidiarrhoeals
Antibiotics

Antimicrobial drugs	Antitubercular
Antifungal drugs	Antiviral drugs
Antimalarial	Anthelmintic
Amoebicidal	Antifilarial
Antithyroid drugs	Antidiabetic
Contraceptive drugs	Oxytocic
Uterine relaxant	Galactogogues
Local antiseptics	Vaccines
Anti-snake venom (ASV) serum polyvalent	Rabies vaccine
Antirabies serum (ARS)	Vitamins
Minerals	Water imbalance & IV fluids

Introduction to Pharmacology

Definition

Pharmacology

Pharmacology is derived from Greek word "*Pharmacon*" meaning a "*Drug*" and "*logos*" meaning "*Science*". In short, Pharmacology can be defined as the science of drugs. To make it more clear, one should understand the meaning of the word "*Drug*"

Drug

Drug is derived from French word "*drogue*" meaning 'a dry herb'. World Health Organization (WHO) defines drug as "any substance or product that is used or intended to be used to modify or explore physiological systems or pathological states for the benefit of the recipient".

Historical Development

The world's oldest known pharmacological and therapeutic writings come from India and China. The earliest Indian records are the *Vedas*. Although there are medical descriptions in *Rigveda* (3000 BCE.), it was *Charaka*, a renowned ancient Indian physician, later *Susruta* and *Vagbhata*, who described various medicinal preparations included in Ayurveda. These treatises described vegetable drugs and were classified based on various parameters. In the later years, alchemical and chemical substances superseded to a certain extent. The historical development may be summarized as below

Time period	Development
3000 BCE	India- Vedas- reference to use of plant, animal and mineral origin drugs for therapeutics

2735 BCE	China-"Pan Tsao"- Doctrine of signatures
1900 BCE	Egypt- 'Papyri' accounts to medical experiences
700 BCE	Babylonian clay tablet- mentions 300 drugs
450 BCE	Greece- Hippocrates, a physician
1783-1855 CE	Introduction of experimental procedures in animals by Francois Magendie
1813-1878 CE	Claude Bernard- Father of experimental medicine
1847 CE	Rudolf Buchheim ushered Pharmacology as an experimental science
-	Oswald Schmiedeberg, 'father of pharmacology', along with many disciples propounded fundamental concepts in pharmacology.
1908 CE	John Jacob Abel, founded American Society of Pharmacology & Experimental therapeutics

Pharmacokinetics: It is the study of the absorption, distribution, metabolism and excretion of drugs and their relationship to pharmacologic response (what the body does to the drug)

Pharmacodynamics: It is the quantitative study of the biological and therapeutic effects of drugs (what the drug does to the body). Such study elucidates the mechanism of drug action.

Clinical Pharmacology: It is the scientific study of drugs in man. It includes pharmacokinetic and pharmacodynamic investigation in healthy volunteers and in patients; evaluation of efficacy and safety of drugs and comparative trials with other forms of treatment; surveillance of patterns of drug use, adverse effects etc. The aim of clinical pharmacology is to generate data for optimum & rational use of drugs.

Chemotherapy: It is the treatment of systemic infection/malignancy with specific drugs that have selective toxicity for the infecting organism/malignant cell with no/minimal effects on the host cells.

Toxicology: It deals with the toxicity of drugs and poisonous effects of various chemicals in use, with emphasis on detection, prevention and treatment of poisonings.

Drug Nomenclature

A drug generally has three categories of names:

Category	Chemical name	Nonproprietary name (Generic name)	Proprietary name
Definition	Name given as per the chemical structure of a drug	Name assigned by a competent scientific body, which will be uniform all over the world.	Name assigned by the manufacturer and is its trade name.
Example	p-acetamidophenol	Paracetomol	Crocin (Duphar); Calpol (Wellcome)

Nature & Sources of Drugs

The drugs may be obtained from either of the following sources.

1. Synthetic source: Presently the majority of drugs are obtained synthetically or semi synthetically. Some of the drugs which were earlier obtained from plant or animal source are today synthesized in the laboratories. Eg: Aspirin, Paracetamol etc.
2. Vegetable source: Some drugs are obtained from plant sources

   Eg: Nicotine from tobacco leaves,

   Digoxin from leaves of *Digitalis purpurea* L.

   Essential oils from eucalyptus, clove

   Fixed oil from castor seeds

   Gum from gum acacia
3. Animal source: Many drugs are obtained from animal sources, like insulin from pancreas, Vitamin B_{12} from liver extract.
4. Microbiological source: Some of the fungi, mould, bacteria are important source of many drugs, as, Penicillin from *Penicillium notatum*, Streptomycin from *Streptomyces griseus*.
5. Mineral source: Many minerals are also used in Pharmacotherapy, as ferrous sulphate for anemia, Magnesium sulfate as purgative, Sodium bicarbonate as antacids and radioactive iodine for diagnosis and treatment of thyrotoxicosis.
6. Genetically engineered drugs: This relatively new methodology involves development of drugs from gene- DNA. Eg: Recombinex HB- a hepatitis –B vaccine, Insulin from Human insulin.

	Source	Example
Synthetic	Drugs prepared or synthesized artificial in a lab are Synthetic drugs. Presently majority of drugs are obtained synthetically or semi synthetically.	Aspirin, Paracetamol
Vegetable	Some drugs are obtained from plant sources	Nicotine from tobacco leaves, Digoxin from leaves of *Digitalis purpurea* L.
Animal	Many drugs are obtained from animal sources	Insulin from pancreas, Vitamin B_{12} from liver extract.
Microbiological	Some of the fungi, mould, bacteria are important source of many drugs	Streptomycin from *Streptomyces griseus*
Mineral	Many minerals are also used in Pharmaco-therapy	Ferrous sulphate for anemia , Sodium bi carbonate as antacids, radioactive iodine for diagnosis
Genetically engineered	This relatively new methodology involves development of drugs from gene- DNA.	Recombinex HB- a hepatitis –B vaccine

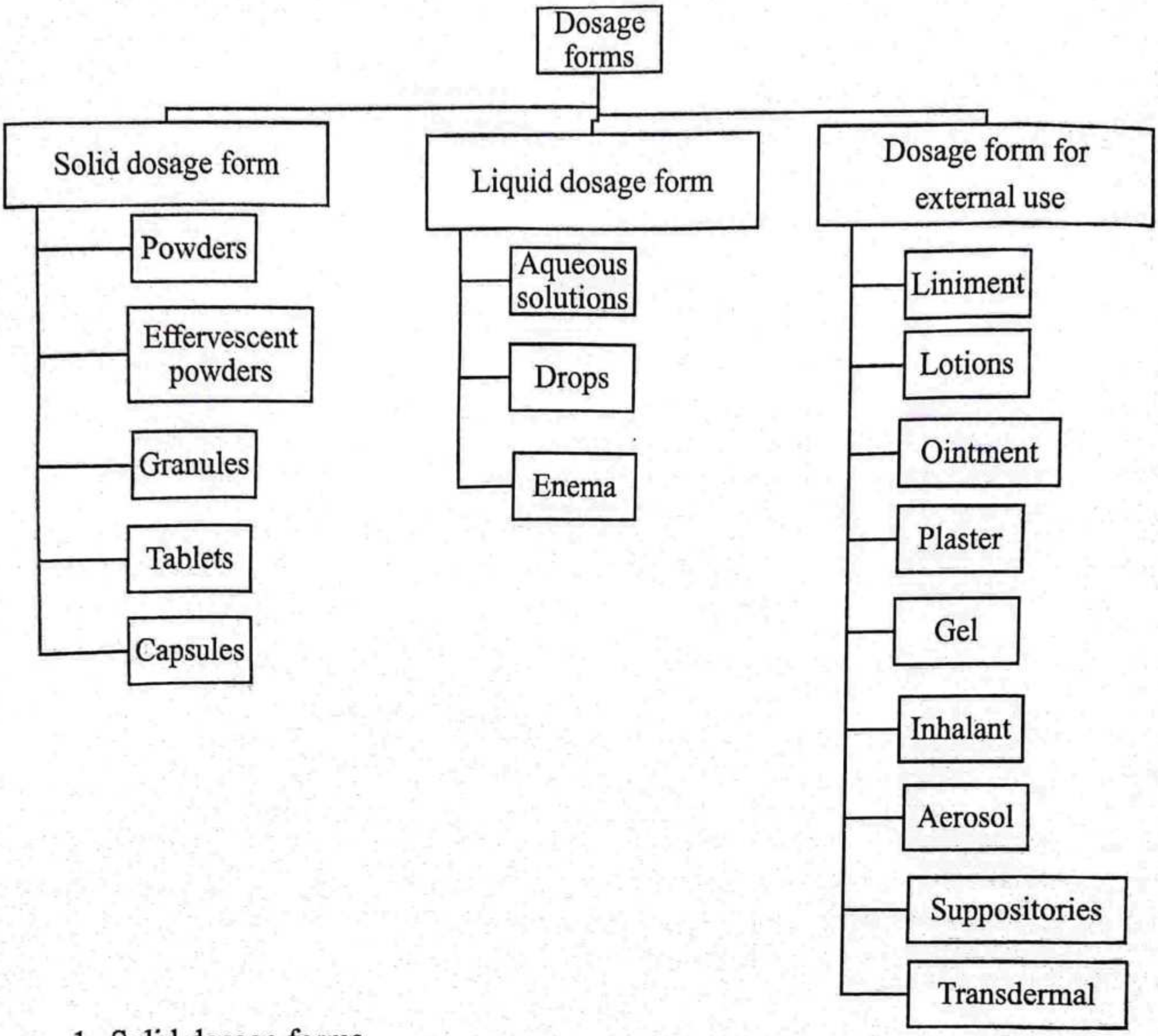
11. Drug definition, drug dosage forms, route of drug administration, pharmacokinetics (ADME), pharmacodynamics, Drug dose, principles of drug action, mechanism of drug action & bioavailability

Drug dosage forms

The drugs are not administered as such but are formulated as liquids, capsules or injections. Some terms to be familiar are:

- Formulations: It is a recipe by which a drug is prepared. It contains a list of active ingredients (the drug) and other substances, like excipients, vehicles, flavoring agents and preservatives with the amounts therein.
- Dosage form: It is the form (e.g. as tablet or capsule) in which the above formulation can be administered to a patient.
- Excipients: Are pharmacologically inert substances which are added to the pharmaceutical preparation either to add bulk to active drug used in extremely small quantities or to mask the unpleasant taste. E.g.: Lactose, Starch.
- Vehicles: It is a substance used to dissolve or suspend the drugs to make them better applicable (as in ointments) or more palatable (as in sugar syrup)

Based on the nature/form of the drug, dosage forms may be classified as :



1. Solid dosage forms

a. Powders- May be simple (one drug) or mixture of drugs in a dried and finely pulverized form intended for external use. E.g.: Dusting powder – Boric acid.

b. Effervescent powders- Are powdered drug mixed with sodium bicarbonate or citric acid. When dissolved in water, they effervesce with evolution of carbon dioxide. E.g.: Eno fruit salt.

c. Granules- Are small aggregates of powder held together by a binding agent (e.g.: starch). E.g. - Vitamin D_3 granules. Some of these formulations can be dissolved in a specified volume of water to make a suspension for immediate oral use in children.

d. Tablets-Powdered or granulated form of drug compressed under high pressure

into round or disk shape suitable for swallowing. These may be of the following varieties:

- Ordinary- these are uncoated compressed tablets. E.g.: Aspirin
- Sugar coated- Tablets covered over by sugar to avoid bitter taste. E.g.: Chloroquine
- Film coated-tablets covered by transparent gelatin or cellulose to overcome unpleasant taste.
- Enteric coated- tablets coated with shellac or keratin which is resistant to gastric acid but dissolves at intestinal pH. Thus protects drug from being destroyed by gastric juice and avoids gastric irritation. E.g.: Enteric coated Diclofenac.
- Long retard- Aggregated drug particles have individual coating with different types of inert materials, so that they dissolve at different time and thus provide sustained release of drug over a long period of 10-12 hours.
- Lozenges- A chewable tablet, containing the drug with sugar and gum. Is meant to chew or suck for providing local effects in mouth or throat. E.g.: Strepsils.

e. Capsules- are tasteless gelatin containers of different sizes having powdered drug and are meant for swallowing.

2. Liquid dosage forms

a. Aqueous solutions-

- Syrups- These contain drug(s) in concentrated solution of sugar plus flavoring agents and permitted colors. E.g.: Cough syrups.
- Injections- These are sterile solutions or sterile suspensions of the drug in suitable solvent and preservatives and are meant for parenteral use. E.g.: Inj. Xylocaine

b. Drops- These are mainly pediatric formulations which contain small amount of highly concentrated solutions of drug. E.g.: Vitamin drops, eye drops.

c. Enema- These are medicated liquid preparations for rectal administration, used for evacuation of colon. E.g.: Soap water enema.

3. Dosage forms for external use

a. Liniments-These are liquid medicaments to be rubbed on skin with friction. It contains drug(s) in a liniment vehicle (fixed oil/soap) and water /alcohol. One ingredient is usually camphor which serves as counter irritant. E.g.: Liniment Camphor

b. Lotions- These are liquid medicaments for local application but without rubbing. Generally used as antiseptics/soothing/antipruritic. E.g.: Zinc calamine

c. Ointments- These are soft, semi-solid mass containing the drug in a greasy base, like paraffin. E.g.: Soframycin skin ointment

d. Plaster- It contains a drug mixed in a resinous base spread over a muslin cloth. It is protective/antiseptic. Eg: Zinc oxide plaster/Band aids

e. Gels- The drug is dissolved in a liquid and then dispersed in some gelling agent. Eg: Contraceptive gels

f. Inhalants- Liquid preparations containing a drug to be inhaled as vapor. Contents may be poured into a jug of boiling water and inhaled. Solid inhalants are inhaled with nebulizers.

g. Aerosols- The drug dissolved in a liquid is put inside a cylindrical container and is then filled with a propellant gas under pressure. A push at the value releases the drug through a micro fined orifice in the form of a mist which is inhaled. Eg: Salbutamol metered aerosol.

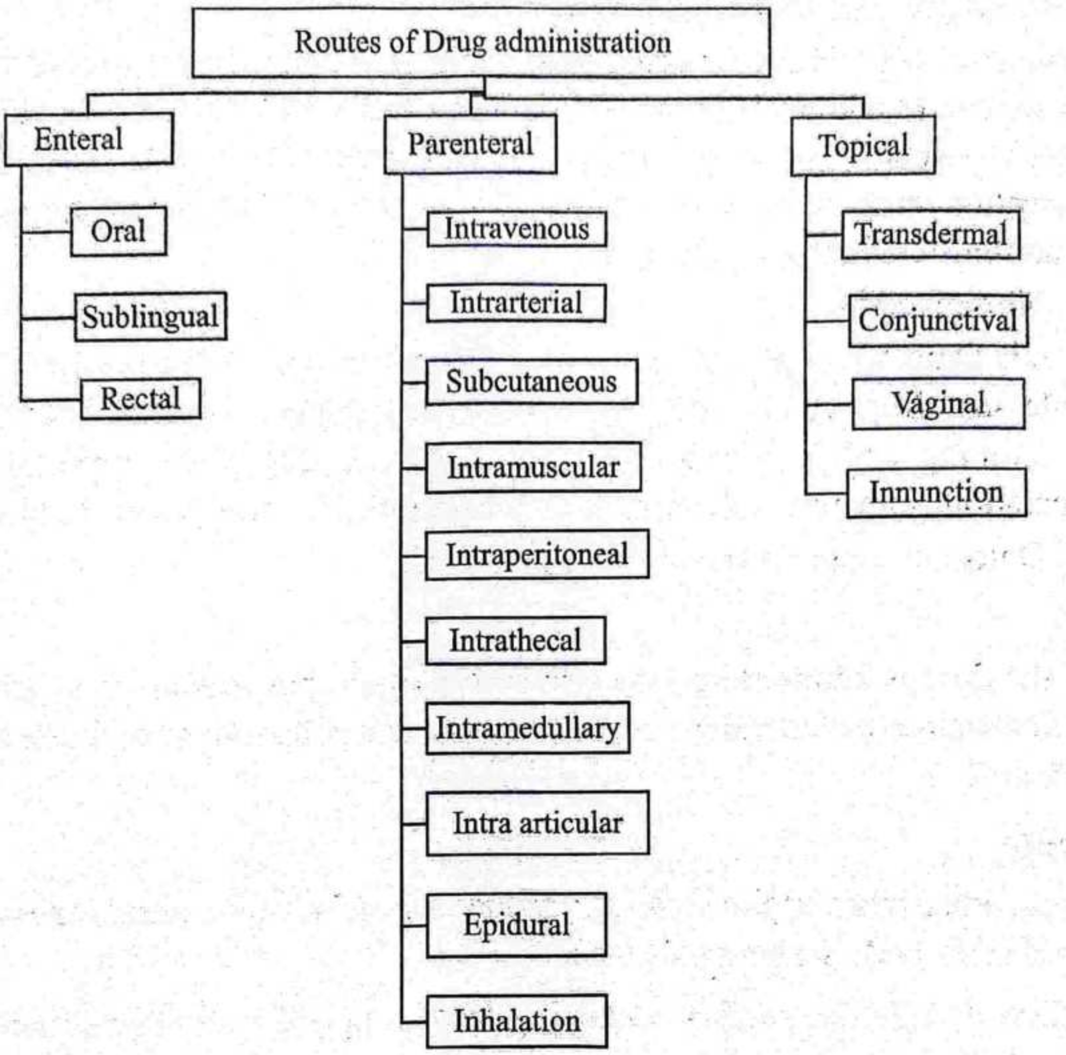
h. Suppositories- These contain drug mixed with glycerin/gelatin/hard soap. These remain solid at room temperature but become slippery and melt at body temperature.

- Suppositories: used as rectal insertions and are bullet shaped. Eg: Dulcolax
- Pessaries : used as vaginal insertions and are conical
- Bougies : used as urethral insertions, are pencil shaped.

i. Transdermal Adhesive patch- In these adhesive patches, the drug is incorporated into a polymer which in turn is bonded to an adhesive plaster.

Routes of Drug Administration

The mode of drug administration affects both the rate at which onset of action occurs and the magnitude of the therapeutic response that results. Therefore the choice of the route of administration is crucial in determining the suitability of a drug for an individual. The routes of administration may be classified into the following categories:



Enteral:

Placement of a drug directly into any part of the gastrointestinal tract refers to the enteral route.

1. Oral: Giving a drug by mouth is oral route. This is the most common route and has its own merits and demerits which are enlisted in the table below

Merits	Demerits
• Safe	• Onset of action is slow
• Convenient	• Unpalatable drugs cannot be given
• Painless	• Cannot be used in uncooperative/uncon scious/vomiting patient
• Economical as sterilization is not essential	• Some drugs may be destroyed by gastric juice
• Does not require assistance	• Drugs having first pass effect cannot be given.
• Non invasive	
• Both solid & liquid dosage forms can be given	

Table: Merits and Demerits of Oral route

2. Sublingual: The route is referred to as sublingual when drug is placed beneath the tongue (sublingual) or placed between teeth and mucous membrane of cheek (buccal). The major merits of this route are quick onset and on absorption reach systemic circulation. But distasteful and irritant drugs cannot be administered through this route.

   Eg: Nitroglycerine

3. Rectal: Drug when placed in rectum. The advantage of this route is certain unpleasant drugs can be administered as enema/suppositories and can be used in vomiting and unconscious patients. Though this route bypasses portal circulation, sometimes absorption may be erratic due to intestinal contents.

   Eg: Dulcolax suppositories

Parenteral

When the drug is administered through routes other than enteral, it is termed as parenteral. The various parenteral routes, their merits, demerits and example are enlisted in the table below.

Topical route

Drugs absorbed when applied topically to the skin and mucous membranes of various structures in the body are generally rapid.

Transdermal: Adhesive patches containing drug is applied on skin for sustained and steady release of drug Eg: Scopolamine

Conjunctival: Drug administered to the conjunctive produces local effect.

Inunction- Rubbing drug over skin is inunction. Massaging over skin creates warmth, which in turn enhances absorption of drug as capillaries are dilated with increased blood flow.

S.N.	Route	Merit	Demerit	Example
1.	Intravenous- When drug is administered through the veins	• Rapid action • By passes first pass effect • Smallest dose required with 100% bioavailability	• Risky route, as vital organs exposed to high concentration of drug • Aseptic conditions to be followed • Self-injection not possible	Morphine
2.	Intra-arterial- drug is administered into the artery	• Rapid onset of action • Useful for diagnostic studies like angiog-rams	• Risky • Painful • Aseptic precautions required	Angiogram

			• Skill required	
3.	Subcutaneous- when drug administered beneath the skin, into the connective tissue/ fat beneath dermis	• Uniform & sustained action • Minimizes risk of i.v • Self-administration is possible • Repository preparations can be injected for prolonged action	• Only non-irritant drugs can be given • Absorption slower than i.v • Should be avoided in patients of shock	Insulin
4.	Intramuscular- Drug is injected into skeletal muscle	• Mild irritants may be given • Absorption faster & uniform	• Self-administration not possible • Aseptic precautions required • Skill required • Chances of abscess, nerve damage	
5.	Intraperitoneal- When the drug is administered into the peritoneal space	• Rapid absorption • Used in infants • Used for peritoneal dialysis	• Painful • Aseptic conditions required • Risk of infections	
6.	Intrathecal- In this, the drug is administered into the spinal subarachnoid space	• By passes blood brain barrier • Used as diagnostic aid	• Requires expertise to administer • Painful & risky • Aseptic precautions to be followed	Xylocaine
7.	Intramedullary- Drug is administered into bone marrow	• Fast absorption	• Risky • Painful • Aseptic precautions required • Rarely used	
8.	Intra articular- Drug when administered into a joint(synovial cavity)	• Endures higher concentration in a localized area • Used for pain management , joint mobility	• Risky • Painful • Aseptic precautions required	Hydrocortisone
9.	Epidural- Drug when injected via a small catheter into the epidural space	• Increasing used for pain management	• Risky • Painful • Aseptic precautions required	
10.	Inhalation- When drug is inhaled through nose/mouth	• Rapid delivery • Bronchodilators may be administered for local effects	• Drugs may cause cardiac toxicity as it enters heart through pulmonary veins	Salbutamol General anaesthetics

		• Can be given in the form aerosols	• Local irritation may cause respiratory tract secretion and bronch-ospasm	

Table: Parenteral routes- merits & demerits

Pharmacokinetics

Background: Certain terms for better understanding

1. Ion- An atom in which total number of electrons is not equal to total number of protons, giving it a net positive (+) / negative charge (-)
2. Electrolyte- a substance which forms ions in an aqueous solution.
3. Weak electrolyte- is an electrolyte that does not completely dissociate in solution. The solution will contain both ions and molecules of the electrolyte.
4. Non-polar- A compound that is nonionic/ does not dissociate into ions.
5. pH- the negative logarithm (base 10) of the molar concentration of dissolved hydronium ions (H_3O^+)

Pharmacokinetics (PK) is derived from two words; 'pharmacon' meaning 'drug' and 'kinesis' means movement. It is the quantitative study of drug movement in, through and out of the body. It is "what body does to the drug". It includes absorption (A), distribution (D), metabolism (M), and excretion (E).

Absorption

The movement of drug into the blood stream from its site of administration is absorption.

Background: *Bio transportation:* Once drug is administered, it has to move from the site of administration to tissues, where it will act. This movement or translocation of drug from one side of the biological barrier to the other is called bio-transport and the mechanisms underlying the transfer of a drug across the biological barriers are called as transport mechanisms. All pharmacokinetic processes involve transport of drug across biological membranes

Drugs are transported across membranes by

1. Passive transport- Transport of substances passively without expenditure of energy from higher concentration to lower concentration. It is of two types; simple diffusion and facilitated diffusion

a. Simple diffusion- Transport of substances along any type of gradient (concentration or electrical or both) without expenditure of energy, across membrane. It is like swimming in the direction of water flow in a river.

It could be through lipid layer, as in the transport of oxygen, CO_2, alcohol or diffusion through protein layer, as in Na channels, K channels.

b. Facilitated or Carrier medicated - water soluble substances having larger molecules diffuse. The drug will be transported after binding with a carrier protein. On binding with drug, the carrier protein undergo structural change and carry the substance in.

2. Active transport- Movement of drug from lower to higher concentration with expenditure of energy. Movement of substances against the chemical or electrical gradient, using energy is called active transport. Ions like Sodium (Na^+), Potassium (K^+), Calcium (Ca^+), glucose, amino acids pass using active transport. It is of two types; primary active transport and secondary active transport

a. Primary active transport- This is the type of active transport, in which energy is liberated directly from the break down of ATP. Na^+, K^+, Ca^+, H^+, Cl^- ions pass through primary active transport.

b. Secondary active transport- When sodium is transported by a carrier protein, another substance is also transported by the same protein simultaneously, either in the same direction or opposite. Co-transport is seen in glucose and amino acid absorption from intestine into blood and reabsorption from renal tubule into blood. Counter- transport is seen in exchange of Ca^+ with Na^+ in all cells.

3. Special movements include

a. Bulk flow- diffusion of large quantity of substances from a region of high pressure to low pressure, as seen in oxygen transfer from alveoli to blood.

b. Endocytosis- taking in of matter by invagination of its membrane to form a vacuole. It could be pinocytosis (cell drinking), phagocytosis (cell eating) and at times could be mediated by receptors.

c. Exocytosis- process by which substances are expelled out.

d. Osmosis- flow of water or solvent through a semipermeable membrane from a compartment with lower solute concentration to another compartment with higher solute concentration.

Important sites of absorption: A few important sites from where drug enters into systemic circulation are

1. *Gastro intestinal tract* (g.i.t)- absorption of drugs from g.i.t. is mainly by passive diffusion. Gut is more permeable to non-ionized, lipid soluble form of drugs and less permeable to ionized form.

First Pass Metabolism (Presystmeic Metabolism) : It is a phenomenon of drug metabolism whereby the concentration of a drug, specifically when administered orally, is greatly reduced before it reaches the systemic circulation. It is the fraction of drug lost during the process of absorption which is generally related to liver and gut wall.

After a drug is swallowed, it is absorbed by the digestive system and enters the hepatic portal system. It is carried through the portal vein into the liver before it reaches the rest of the body. The liver metabolizes many drugs; sometimes to such an extent that only a small amount of active drug emerges from liver. Thus, the first effect (metabolism) may greatly reduce the bioavailability of the drug.

2. *Parenteral site*- Drugs when injected intravenously are completely absorbed, as they reach the blood stream directly without crossing any membrane. Absorption following intramuscular and subcutaneous injections usually occurs by passive diffusion from injection site to plasma/lymph.
3. *Lungs*- Lipid soluble drugs when given in vaporized form (general anesthesia) or as aqueous solution spray (e.g. Salbutamol) are absorbed by simple diffusion from mucous membrane of trachea and lungs.
4. *Topical*-Absorption of most drugs through intact skin is poor as the keratinized epidermis behaves like a barrier to permeability. However, underlying dermis is quite permeable to many lipid soluble drugs.

Bioavailability (BA): It is defined as the rate and extent to which the active concentration of the drug is available at the desired site of action (i.e., blood). It is the fraction/ percentage of drug that reaches systemic circulation following administration in any route.

BA= AUC (oral) x 100/ AUC (IV)

Where, AUC is area under curve, BA is bioavailability, IV is intravenous

BA drugs from different routes:

- IV: 100%
- IM/SC/sublingual: >75%
- Transdermal: 80-100%
- Rectal: 30-100%
- Oral: variable 30-100% low due to first pass metabolism.

To measure BA:

a) Drug is given IV

b) Then plasma concentration is measured at hourly interval and then plotted against time on graph paper

c) Similarly, plasma concentration- time graph of oral dosage of same dose is obtained

d) Once these curves are obtained AUC is measured

Bioequivalence: Bioequivalence is the comparison of BA of different formulations of same drug. Since oral formulations containing same amount of drug from different manufactures may have different plasma concentration they could become non bio-equivalent. These differences may be due to differences in rate of disintegration and/or dissolution. Non- bioequivalence or bioequivalence can lead to therapeutic failure/toxicity

Factors affecting Absorption & Bioavailability:

1. **Pharmaceutical factors of drug-** like particle size, salt form, nature of excipients used, degree of ionization.
2. **Pharmacological factors of drug-** Gastrointestinal motility and gastric emptying, gastrointestinal disease, food and other substances, first pass effect, drug-drug interactions, pharmacogenetic factors.

- A drug usually dissolves more rapidly when its surface area is increased by decreasing its particle size.
- In general, factors that accelerates gastric emptying permit drugs to reach the large absorptive surface area of small intestine sooner, and increase the bioavailability unless the drug is slow to dissolve. Prompt gastric emptying is also important for drugs that are unstable in gastric fluid (e.g., Penicillin-G). Gastric emptying is promoted by fasting, anxiety, lying on right side. It is retarded by fatty diet, endogenous depression.
- First Pass Effect- All drugs taken orally, first of all pass-through GIT wall & then through portal before reaching systemic circulation. First pass effect means the drug degradation occurring before the drug enters the systemic circulation.

Distribution

Definition: Drug distribution means the 'pattern of scatter' of the specified amount of drug to various locations within the body.

Once the drug is absorbed into blood (systemic circulation), drug is distributed to different tissue compartments in the body. In this process it crosses many barriers, then reaches the site of action. Thus, after absorption, the drug may not only get reversibly associated with its site of action(receptor) but may get bound to plasma proteins or may accumulate in various storage sites or may enter into the tissues which are not involved in its primary action (though may be involved into metabolism & excretion).

Factors determining distribution

- Lipid solubility
- Ionization
- Vascularity
- Binding to plasma and cellular proteins

Special compartments for drug distribution

Plasma protein binding (PPB) - In the blood, drug gets bound to plasma protein and form drug-protein complex. Acid drugs are bound to albumin, while basic drugs are bound to í- acid glycoprotein. Free drug is available for action, metabolism and excretion, while the plasma bound drug acts as a reservoir for drug. As free drug concentration decreases, bound drug is released. Protein bound drugs are not metabolized/excreted and hence highly PPB drugs are long acting.

Besides plasma proteins, other tissues of the body can also act as reservoirs for drugs, usually these are not those where they exert their pharmacological effects.

- Cellular reservoirs: certain drugs may have affinity to certain tissues; eg- Iodine in thyroid
- Fat reservoir: Highly lipid soluble drugs tend to get accumulated in fat and adipose tissue
- Transcellular reservoir: Certain drugs may store in aqueous humor, CSF
- Bone & connective tissue: Certain drugs accumulate in nails, bones, teeth, skin

Physiological barriers of drug distribution

- *Blood brain barrier-* The endothelial cells of brain capillaries are tightly joined, lack intercellular pores and glial cells cover these capillaries. Together, they constitute the blood brain barrier (BBB). Only lipid soluble, non-ionized drugs cross BBB and penetrate the brain.
- *Placental barrier-* non-ionized lipid soluble drugs cross placental barrier more than lipid insoluble drugs.

Volume of Distribution/Apparent volume of Distribution

Volume of distribution (Vd) is the volume necessary to accommodate entire volume of given drug, if the concentration throughout the body were equal to that of plasma.

Vd = Amount of drug in the body/plasma concentration

Highly plasma bound drug have small Vd

Metabolism

Definition: Biotransformation/Metabolism is the chemical alteration of drug in living organism. It converts lipid soluble non-ionized drugs to water soluble ionized drugs which are not reabsorbed but excreted from the body.

Sites of Metabolism

Primary: Liver

Others: GIT, kidneys, lungs, blood, skin, placenta etc.

Consequences of metabolism

Biotransformation of drugs may lead to:

1. Inactivation- Most drugs and their active metabolites are rendered inactive or less active.
2. Active metabolite from an active drug- Drug may be partially converted to one or more active metabolite
3. Activation of inactive drug- Few drugs convert to a active metabolite (pro drug)
4. Active drug to toxic metabolite- Some drugs convert to a toxic metabolite.

Pathways of Metabolism

Biotransformation reactions can be classified into

1. *Phase I/ Non synthetic/Functional reactions*: This involves conversion either in the form of oxidation, reduction or hydrolysis. The metabolite at the end of Phase I reaction may be active or inactive. If the metabolite is polar, it is excreted by kidneys. However, certain metabolites remain lipid soluble and hence are reabsorbed and undergo Phase II reactions.
2. *Phase II/Synthetic/Conjugation reactions*: This involves conjugation with an endogenous substance, the result of which the drug becomes inactive, polar, water soluble and hence excreted.

These biotransformation reactions are catalyzed by microsomal and non-microsomal enzymes.

Factors modifying Metabolism

1. Age- Neonates & elderly have decreased metabolizing capacity, hence increased toxicity
2. Diet- Protein deficiency decrease metabolism. Carbohydrate rich food decreases metabolism.
3. Disease- Liver diseases decrease metabolism of drugs, thus increases duration of drug action in the body.
4. Pharmacogenetics- Pharmacogenetics is study of genetically determined variation in drug response. Genetic abnormality may alter drug response. In certain individuals, due to genetic abnormality, absence/abnormal enzymes fail/ delay to metabolize drugs leading to toxicity/death.

Excretion

Definition: Removal of drug and its metabolites from body is Excretion.

Drugs are eliminated from the body either unchanged or as water soluble ionized metabolites. Both the processes of metabolism and excretion are essential for the elimination of drugs from the body.

The major routes of drug excretion are-

1. Renal 2. Biliary 3. Fecal 4. Alveolar

Other minor routes of drug excretion include- Milk, Skin, Hair, Sweat, Saliva

1. *Kidney*: The most important organ for elimination of free drugs and their metabolites. Smaller molecular weight drugs are easily filtered during glomerular filtration. During tubular reabsorption, reabsorption takes place by passive diffusion and is dependent on lipid solubility, ionization, pH of urine. Strong acids and strong basics remain ionized and hence excreted. Weak acidic drugs remain unionized in acid urine and hence are reabsorbed. Therefore, if urine is made alkaline, weak acidic drugs will be excreted. Similarly, weakly basic drugs remain unionized in alkaline urine and hence are reabsorbed. If urine is made acidic, weakly basic drugs become ionized and hence easily excreted.
2. *Biliary*: In liver cells, certain drugs are transferred from plasm to bile. These are then subsequently eliminated through feces. Some drugs are secreted through bile, but are reabsorbed from intestine to be excreted in bile again and this cycle repeats. This recycling is termed as ***enterohepatic circulation***. This recycling increases BA/ duration of action.
3. *Fecal elimination*: Substances excreted in feces are drugs not completely absorbed from g.i.t.
4. *Excretion through breast milk*: Breast milk is acidic and hence basic drugs are excreted. This may affect the infants fed with milk. For example, Tetracyclines secreted in milk chelates developing teeth and bones in sucking infant. This can lead to abnormal bones & teeth.
5. *Lungs (Alveolar excretion)* - Excretion depends on their partial pressure in blood. Gases and volatile liquids, like, General anesthetics, ether, alcohol are eliminated through breath

Kinetics of Drug Elimination

Once the drug is administered intravenously, it enters the blood & is rapidly distributed to various tissues. By taking repeated blood samples, the fall in plasm concentration

of drug, as related to time, can be plotted on graph and from such plots the plasm half-life (t) of a drug can be measured.

Plasma half-life (t) means the time duration in which the plasm concentration of the drug falls by 50% of the earlier value. It reflects duration of action, elimination kinetics and is an important parameter for dose schedule. It estimates time required for steady-state concentration.

Clearance (CL) is defined as the volume of blood cleared of drug per unit time. Clearance predicts the rate of elimination of the drug in relation to the drug concentration.

Rate & pattern of drug elimination follows:

1. **First order kinetics-** A constant fraction of drug is eliminated per unit time. Rate of drug elimination is directly proportional to its plasma concentration. t 1/2 will always remain constant. Most of the drugs are eliminated by first order kinetics.
2. **Zero order kinetics-** Constant amount of drug is eliminated per unit time. Rate of elimination is independent of its plasma concentration. t is not constant in drugs following zero order kinetics.

Pharmacodynamics

Pharmacodynamics (PD) is derived from two words; '*pharmacon*' meaning 'drug' and '*dynamics*' meaning action. It is concerned about the mechanisms of action of the drug, i.e. to know what drugs do and how they do it. It is the study of the biochemical and physiological effects of drugs and their mode of action.

Principles of Drug action

Drugs do not impart new functions to any system, organ or cell; they only alter the pace of ongoing activity. The basic types of drug action can be broadly classified as

1. Stimulation: It is selective enhancement of the level of activity of specialized cells.

   E.g.: Adrenaline stimulates heart
2. Depression: It is selective diminution of activity of specialized cells.

   E.g.: Omeprazole depress gastric acid secretion
3. Irritation: This refers to a nonselective, often noxious (harmful) effect and is particularly applied to less specialized cells (epithelium, connective tissue). Strong irritation may lead to inflammation, corrosion, necrosis, while mild irritation may stimulate associated function.

   E.g., Bitters increase salivary and gastric secretion.
4. Replacement: This refers to the use of natural metabolites, hormones or their congeners in deficiency states.

E.g., Insulin in Diabetes mellitus, Iron (Fe) in anemia

5. Cytotoxic action: Selective cytotoxic action on invading parasite or cancer cells, killing them without significantly affecting host cells. (Used in infections & neoplasms).

   E.g.- Penicillin

Mechanism of Drug action

Barring a handful of drugs whose actions can be explained on the basis of their simple physical or chemical properties, majority of drugs act in complex manner- all elements of which are seldom known. The fundamental mechanisms of drug action can be distinguished into four categories:

1. Physical action- A physical property of the drug is responsible for its action.

   E.g., In Ispaghula, the ability of the drug to absorb water and increase mass helps to bring out laxative action.

   E.g., Magnesium sulphate retains fluid inside lumen by osmosis, thus increasing fecal bulk and brings out laxative action.

2. Chemical action- The drug reacts extracellularly according to simple chemical equation.

   E.g., Antacids neutralize gastric HCl.

3. Through enzymes- Almost all biological reactions are carried out under catalytic influence of enzymes; hence enzymes are a very important target of drug action. Drugs can either increase or decrease the rate of enzymatically medicated reactions.

   a. Stimulation- Drugs which stimulate the enzyme & thereby influence the rate of reaction.

   b. Inhibition- Inhibition of enzymes is a common mode of drug action. This may be specific or non-specific.

   E.g., Enalapril inhibits angiotensin- converting enzyme (ACE) inhibitors

4. Through ion channels- Drugs interfere with movement of ions across specific channels.

   E.g., Calcium channel blockers, potassium channel blockers.

5. Through receptors- Most drugs exert their effects, both beneficial & harmful, by interacting with receptors.

Receptors

- Receptors are specialized target macromolecules present on the cell surface or intracellularly which binds with specific drugs and mediate pharmacologic

actions. Binding of a drug with its receptor results in the formation of the drug-receptor complex and leads to a biologic response.

- Langley and Ehrlich put forward a concept of 'receptor substance'. Clark explained drug action based on drug receptor occupation.
- **Affinity**: Ability of a drug to bind to a receptor
- Intrinsic activity: Ability of a drug to elicit a response after binding to the receptor.
- **Agonist**: A substance that binds to the receptor and produces a response. It has both affinity & intrinsic activity. For example, adrenaline is agonist at í- and g-adrenergic receptors.
- **Antagonist**: A substance that binds to the receptor and prevents the action of agonist on the receptor. It has affinity but no intrinsic activity.
- **Partial agonist**: A substance binds to receptors, but has low intrinsic activity. It blocks the action of full agonists.
- **Inverse agonist**: A substance that after binding to receptors, produce actions opposite to those produce by full agonist.

Combined effect of Drugs

When two or more drugs are given simultaneously or in quick succession, they may be either indifferent to each other or exhibit synergism or antagonism. The interaction may take place at pharmacokinetic level or at pharmacodynamics level.

Synergism (Greek: *Syn*- together; *ergon*- work). When the action of one drug is facilitated or increased by the other, they are said to be synergistic. In a synergistic pair, both the drugs can have action in the same direction or given alone one may be in active but still enhance the action of the other when given together. Synergism can be

- **Additive**- The effect of the two drugs is in the same direction and simply adds up.
- **Supper additive (potentiation)** - The effect of combination is greater than the individual effects of the components.

Antagonism- When one drug decrease or abolishes the action of another, they are said to be antagonistic. Usually in an antagonistic pair, one drug is inactive as such but decreases the effect of the other. Depending on the mechanism involved, antagonism may be:

- **Physical antagonism**- Based on the physical property of drugs. Eg. Charcoal absorbs alkaloids and can prevent their absorption- used in alkaloidal poisoning.

- **Chemical antagonism**- The two drugs react chemically to inactivate the effect. Eg. $KMnO_4$ oxidizes alkaloids- used for gastric lavage in poisoning, antacids neutralize gastric acid.
- **Physiological/functional antagonism**- The two drugs act on different receptors or by different mechanisms, but have opposite overt effects on the same physiological function i.e., have pharmacological effects in opposite direction. Eg. Glucagon and Insulin have opposite effects on a single physiological entity, i.e., on blood sugar level.
- **Receptor antagonism**- One drug (antagonist) blocks the receptor action of the other (agonist). Receptor antagonism may be competitive or non- competitive.

Therapeutics & Rational Use of Drug

Drug Dose

Dose is the appropriate amount of a drug needed to produce a certain degree of response in a given patient.

The strategies adopted for different types of drugs & conditions are

1. **Standard dose-** The same dose is appropriate for most patients. Individual variations are minor or the drug has a wide safety margin so that a large enough dose can be given to cover them.
   Eg: Medendazole
2. **Regulated dose-** The drug modifies a finely regulated body function which can be easily measured. The dosage is accurately adjusted by repeated measurement of the affected physiological parameter.
   Eg: Hypoglycemia, Diuretics
3. **Target level dose-** The response is not easily measurable but has been demonstrated to be obtained at a certain range of drug concentration in plasma.
   Eg: Antiepileptic, Antidepressants
4. **Fixed dose combinations of drugs**- A large number of pharmaceutical preparations contain two or more drugs in fixed dose ratio. Such a fixed dose combinations is convenient, has better patient compliance and may have synergistic effect.

Factors modifying drug action

Variation in response to the same dose of a drug between different patients and even in the same patient at different occasions is observed. The various factors modifying drug response are :

1. Body weight- The recommended dose is generally for medium built persons.

Body weight variation influences the concentration of the drug attained at the site of action.

2. Age- Pharmacokinetics pf many drugs change with age and thus response varies as well.

   Formula to calculate dose in children = Age (years) x adult dose/Age +12
3. Sex- Hormonal changes, small body size influence drug response. Special precautions to be taken while prescribing drugs during pregnancy & lactation.
4. Species & Race- Blacks require higher and Mongols require lower concentration of atropine to produce mydriasis (pupil dilatation)
5. Genetics- Drug response varies individually due to genetic factor.
6. Route of drug administration- Change of route can alter drug response
7. Diet & Environment- Food interferes with absorption of many drugs and thereby may alter drug response.
8. Pathological state- Patients with liver disease, renal disease alters drug metabolism and thereby alter drug response.
9. Presence of other drugs- Drug interactions may alter the drug response.
10. Psychological factor- Drug response depends on doctor-patient relationship, patient's beliefs and fears.

Adverse Drug Effects

Adverse Drug Reaction (ADR) or adverse drug effects is defined as any response to a medicine that is noxious and unintended and which occurs at doses normally used in man.

Adverse drug reactions may be classified as :

Type A (pharmacological): These reactions are predictable as they are based on pharmacological profile of the drug. These are dose related and most common. The severity of reactions are variable but usually mild. These include side effects, toxic effects, secondary effects, drug interactions.

Type B (hypersensitivity): These reactions are unpredictable as they are based on the peculiarities of patient. These are uncommon in occurrence. The severity of reactions are variable but more severe. These include drug allergy & idiosyncrasy.

1. **Side effects**: These are unwanted but often unavoidable pharmacodynamics effects that occur at therapeutic doses. Generally, they are not serious, can be predicted from the pharmacological profile of the drug and are known to occur in a given percentage of drug recipients. Reduction in dose usually reduces the symptoms.

Eg: Atropine is used as a pre-anesthetic medication for its anti- secretory action, the same action produced dryness of mouth as a side effect.

2. **Secondary effects:** These are indirect consequences of a primary action of the drug.

   Eg: Suppression of bacterial flora by Tetracyclines paves way for superinfections.

3. **Toxic effects:** These are the result of excessive pharmacological action of the drug due to overdose or prolonged use.

   Eg: bleeding due to anticoagulants, hepatic necrosis from paracetamol over dosage.

4. **Hypersensitivity (drug allergy):** it is an immunologically mediated reaction producing stereotype symptoms which are unrelated to the pharmacodynamics profile of the drug, generally occur even with smaller doses and have a different time course of onset & duration. This is also called drug hypersensitivity.

5. **Idiosyncrasy:** It is a genetically determined abnormal reactivity to a chemical. The drug interacts with some unique feature of the individual, not found in majority of subjects, and produces the uncharacteristic reaction. As such, the type of reaction is restricted to individuals with a particular genotype.

6. **Drug dependence:** Drugs capable of altering mood & feelings are liable to repetitive use to derive euphoria, recreation, withdrawal from reality, social adjustment etc. Drug dependence is a state in which use of drugs for personal satisfaction is accorded a higher priority than other basic needs, often in the face of known risks to health.

7. **Drug withdrawal reactions:** Sudden interruption of therapy with certain drugs also results in adverse consequences, mostly in the form of worsening of the clinical condition for which the drug was being used, like in the example; frequency of seizures may increase on sudden withdrawal of an epileptic.

Pharmacovigilance

Pharmacovigilance has been defined by the WHO (2002) as the 'science and activities' relating to the detection, assessment, understanding and prevention of adverse effects or any other drug related problems. Its main purpose is to reduce the risk of drug related harm to the patient. It has an important role in the rational use of medicines as it provides the basis for assessing safety of medicines.

The activities involved in pharmacovigilance are:

a. Post marketing surveillance and other methods of ADR monitoring such as

voluntary reporting by doctors, computerized medical record linkage, and cohort/case control studies.

b. Dissemination of ADR data through drug alerts, medical letters, advisories by pharmaceuticals & regulatory agencies

c. Changes in the labelling of medicines indicating restrictions in use or statuary warnings, precautions or even withdrawal.

Important organization involved in Pharmacovigilance in India

Central Drugs Standard Control Organization (CDSCO) - The government of India with the assistance of World Bank has initiated the national pharmacovigilance program. The CDSCO is coordinating the country wide pharmacovigilance program under the aegis of Ministry of health & family welfare, DGHS, New Delhi.[1]

Uppsala Monitoring Center- Uppsala monitoring center (UMC) is an independent, non-profit foundation and a centre for international service and scientific research.UMC was established in Uppsala, Sweden in 1978 as the World Health Organization (WHO) Collaborating Center for International Drug Monitoring. UMC operates the technical and scientific aspects of the WHO's worldwide pharmacovigilance network.[2]

Vigibase- is the unique WHO global databaseof individual case safety reports (ICSRs).It is the largest database of its kind in the world, with over 20 million reports of suspected adverse effects of medicines, submitted, since 1968, by 139 member countries of theWHO Programme for International Drug Monitoring. It is continuously updated with incoming reports.

11.1 Drugs Acting on Central Nervous System: Anaesthetics, Sedative Hypnotics, Antiepileptics, Antiparkinsonian, Antidepressants, Antianxiety Drugs, Opioid - Analgesics Drugs

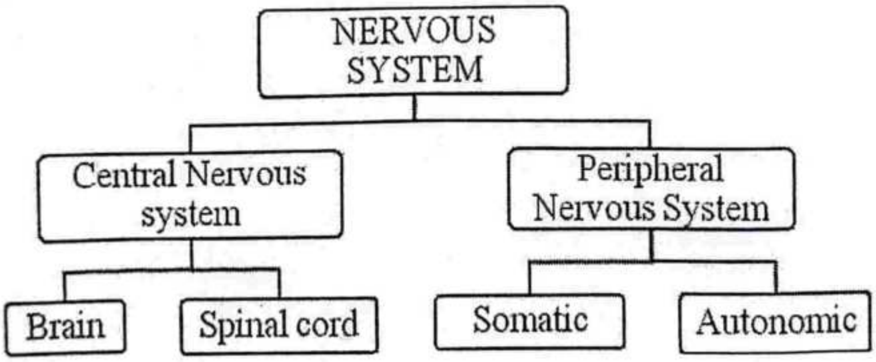
A brief review on Central Nervous System

The nervous system consists of the central nervous (CNS) and the peripheral nervous system (PNS). The CNS, composed of the brain and spinal cord, essentially controls all functions in the body. The PNS is the network that transmits information to & from the CNS, thus altering the CNS to internal & external changes, such as muscle tension, blood vessel alterations, fever, sound, smell, taste, touch & sight. This information is integrated and instructions are then relayed to appropriate cells or tissues to produce necessary actions & environment adjustments.

Information in the nervous system is transmitted both electrically & chemically. This phenomenon occurs because nerve cells have two special characteristics:

1. Conduction- They can conduct electrical signals. The passage of a nerve impulse or an action potential along a nerve fibre or a muscle fibre is called conduction.
2. Neurohumoral transmission- They have intercellular connections with other nerve cells & with innervated tissues such as muscles/glands. The presence of a specific chemical at these connections determines the type of information a neuron can receive & the range of responses it can yield in return. The passage of a nerve impulse across a synaptic or neuroeffector junction with the use of a chemical is called neurotransmission. There are two types of neurohumoral transmission

a. Cholinergic transmission, conducted by cholinergic neurons and acetylcholine is the neuro-hormone
b. Adrenergic transmission, conducted by adrengic neurons and norepinephrine is the neuro-hormone



The peripheral system has two divisions;

- Somatic nervous system, innervating the voluntary/skeletal muscles and
- Autonomic nervous system, which influences involuntary activities of smooth, cardiac muscles & glands.

Autonomous Nervous system

The ANS functions primarily as a regulatory or self- governing system for maintaining the internal environment of the body at an optimal level (homeostasis). This system automatically controls the function of smooth muscle, cardiac muscle & glandular secretions, which interact in many vital physiologic tasks. Digestion of meal, maintenance of the pressure of circulating blood and many other processes are internally regulated by ANS.

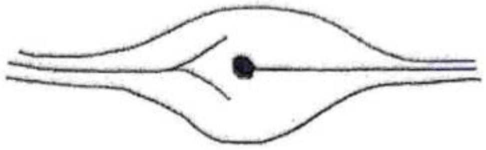
ANS is organized into two subdivisions :

1. Parasympathetic system

2. Sympathetic system

The anatomic arrangement of each system consists of two motor nerves, a preganglionic nerve & a post ganglionic nerve, with a ganglion (group of nerve cell bodies) connecting two neurons.

Post ganglionic nerve
Ganglion
Pre ganglionic nerve



Type	Parasympathetic	Sympathetic
Anatomic	Pre-ganglionic fibers emerge with the cranial nerves III, VII, IX & X, at the sacral spinal levels from about S_3 through S_4	This thoracolumbar system has its pre-ganglionic fibres originate from the thoracic segment T_1 to the lumbar segment L_2
Physiologic	REST & DIGESTFunctions mainly to conserve energy & restore body resources of the organism.These include cardiac deceleration, rise in gastrointestinal activity associated with digestion & absorption & an increase in excretion	FIGHT & FLIGHT Metabolizes the organism during emergency & stress situations.These involve expenditure of energy, increase in blood sugar concentration, heart activity & blood pressure
Terms	Anatomic- Parasympathetic Functional- Cholinergic	Anatomic- Sympathetic Functional- Adrenergic
Neurotransmitter	Acetylcholine (Ach)	Norepinephrine
Blocking drugs	Cholinergic blocking agents (anticholinergic)	Adrenergic blocking agents

Cholinergic transmission

- Synthesis & storage- Ach synthesized in cytoplasm of nerve terminal and stored in synaptic vesicles/granules located in nerve terminal
- Release & action- With an action potential, vesicle approach membrane, releases Ach, diffuses in synapse and attach on membrane of the next neuron/ neuroeffector. This result in increased permeability of membrane to Na & K ions, deploarises and either excites or inhibits the action.
- Receptors- The cholinergic receptor sites are either
- Nicotinic(N)- appear in ganglia of parasympathetic & sympathetic fibres, adrenella medulla, skeletal muscle supplied by somatic nervous system.

- Muscarinic (M) - (postganglionic) located in smooth muscle, cardiac muscle & glands of parasympathetic fibers, effector organs of cholinergic sympathetic fibers.
- Inactivation- after Ach has exerted effect; excess amount is inactivated by enzyme acteylcholinesterase. The metabolites thus formed are inactive & are the same compounds from which Ach is formed.

Adrenergic transmission

- Synthesis & Storage- Epinepherine & Norepinephrine synthesis are medicated by different enzymes, like dopamine, located in postganglionic nerve terminals & in adrenal medullary glands.
- Release & Action- With action potential, vesicle approaches membrane, releases norepinephrine, diffuses in synapse & attach to membrane of next neuron/neuroeffector. α receptors activation leads to excitatory effect, while β receptor activation leads to inhibitory effect.
- Receptors- The adrenergic receptor sites are classified as α receptors, receptors and both have two subtypes
- α – neuronal location: α_1 sites- postsynaptic effector cells
  α_2 sites- presynaptic nerve terminals- controls amount of NE
- β – organ location : β_1 sites- heart
  β_2 sites- smooth muscle of bronchioles, arterioles, visceral organs
- Dopamine receptors : 5 types identified

General Anaesthetics

Definition: These are agents which produce reversible loss of sensation and consciousness.

The cardinal features of general anesthesia are:

- Loss of all sensation, especially pain
- Sleep (unconsciousness) and amnesia
- Immobility and muscle relaxation
- Abolition of somatic and autonomic reflexes

Stages of Anesthesia:

1. *Stage of analgesia:* From beginning of inhalation of anesthetic to loss of consciousness.
2. *Stage of delirium:* From loss of consciousness to beginning of surgical anesthesia, could be associated with excitement such as violent behavior, shouting, crying.

3. *Stage of surgical anesthesia:* Extends from onset of regular respiration to cessation of spontaneous breathing. It is associated with four planes. Respiratory depression is produced as stage advances. Simultaneously there is a loss of reflexes and skeletal muscle relaxation.
4. *Stage of medullary paralysis:* Seen only during overdose. Results in medullary depression cessation of breathing, circulation, finally death.

An ideal anesthetic:

- Provides adequate analgesia and muscle relaxation
- Pleasant, non-irritating, noninflammable
- Smooth & quick induction and recovery
- Administration should be easy and controllable and potent even in low concentrations
- Wide range of safety
- No disruption of cardiovascular functions
- Inexpensive, stable and non-reactive

Classification

1. Inhalational anesthetics- These agents are used through inhalation in a specific concentration.

a. Gases	: Eg. Nitrous oxide, cyclopropane
b. Liquids	: Eg. Ether, halothane, isoflurane

2. Intravenous anesthetics- These agents are given intravenously and produces extremely rapid induction but cannot be eliminated rapidly. Hence IV agents are used for induction and inhalational agents are used for maintenance.

a. Inducing agents	: Eg. Thiopentone sodium, propofol
b. Dissociative anesthesia	: Eg. Ketamine
c. Neuroleptanalgesia	: Eg. Fentanyl
d. Benzodiazepines	: Eg. Diazepam, Lorazepam

Mechanism of action

Exact mechanism are unclear, but a few theories are postulated:

- Inhibit reticular activating system
- Bind to gamma-aminobutyric acid (GABA) receptor chloride channels, thus increase inhibitory neurotransmission
- Block excitatory synaptic transmission

CNS Depressants

Definition: These are agents which depress the central nervous system (CNS).

Tranquilizers

Definition: Tranquilizer, is an old term meaning, a drug which reduces mental tension and produces calmness without inducing sleep or depressing mental faculties. This word is rarely used in the present times, with respect to therapeutic purposes and hence is best avoided.

Sedative

Definition: A drug that subdues excitement and calms the subject without inducing sleep, though drowsiness may be produced. Sedation refers to decreased responsiveness to any level of stimulation; is associated with some decrease in motor activity and ideation.

Hypnotic

Definition: These are agents that induces and /or maintains sleep, similar to normal arousable sleep

Background: Sleep: is a natural periodic state of rest accompanied by varying degrees of unconsciousness & relative inactivity.

The duration & pattern of sleep varies considerably among individuals. It has been recognized that sleep is an architectural cyclic process. The different phases/stages of sleep and their characteristics are:

- *Stage 0 (awake):* From lying down to falling asleep
- *Stage 1(dozing):* less eye movements, neck muscles are relaxed, occupies 3-6% of sleep time.
- *Stage 2 (unequivocal sleep):* little eye movements and can be easily aroused, comprises 40-50% of sleep time
- *Stage 3(sleep transition):* Eye movements are minimal and not easily arousable, comprises 5-8 % sleep time
- *Stage 4(cerebral sleep):* deep sleep, difficult to arouse, comprises 10-20% sleep.

Classification of sleep:

a. Non-rapid eye movement(NREM)

b. Rapid eye movement (REM) associated with dreaming

Normally stages 0 to 4 and REM occur in succession over a period of 80-100min. Then stages, 1 to 4, REM are repeated cyclically.

Sedatives and hypnotics are different grades of central nervous system (CNS) depressants. A hypnotic at lower dose, may act as a sedative and at higher doses, can produce general anesthesia. Thus sedation- hypnosis-general anesthesia may be regarded as increasing grades of CNS depression.

Classification

1. Benzodiazepines:
   - a. Ultra-short acting (< 6hr) : Eg- Triazolam
   - b. Short acting (12-24hr) : Eg- Lorazepam
   - c. Long acting (24-48hr) : Eg- Diazepam
2. Barbiturates
   - a. Ultra short acting: Eg- Thiopentone
   - b. Short acting : Eg- Phenobarbital
   - c. Long acting : Eg- Phenobarbital
3. New agents : Eg- Zolpidem
4. Miscellaneous : Paraldehyde

Uses: A few of the drugs are used in the following conditions

1. Insomnia
2. Anxiety
3. Epilepsy
4. Anesthesia

Antiepileptic

Background: *Epilepsy:* These are a group of disorders of the central nervous system (CNS) characterized by paroxysmal (occurring repeatedly without warning) cerebral dysrhythmia, manifesting as brief episodes (seizures) of loss or disturbance of consciousness, with or without characteristic body movements (convulsions), sensory or psychiatric phenomena.

Classification of seizures

S. N	Type	Sub type	Characterized by
1.	Generalized seizures	Tonic-clonic (Grand Mal Epilepsy)	• Commonest, lasts for 1-2min
			• Sudden loss of consciousness, tonic spasm of uscles throughout body, followed by clonic muscle relaxation, followed by sleep and depression of all CNS functions.

		Absence	• Prevalent in children, lasts about 1/2 min • Sudden momentary loss of consciousness, patient apparently freezes and stares in one direction
		Atonic	• Unconsciousness with relaxation of all muscles • Person drops to the ground
		Myoclonic	• Shock-like momentary contraction of muscles of a limb or whole body
		Infantile	• Seen in infants • Intermittent muscle spasm and progressive mental deterioration.
2.	Partial	Simple	• Lasts for 1/2-1 min • Convulsions confined to group of muscles, without loss of consciousness
		Complex	• Most common and lasts for 1-2 min • Purposeless movements with impairment of consciousness

Definition: These are agents which suppress epileptic attacks.

The aim of treatment in epilepsy is :

- Complete control of seizures
- Return patient to an otherwise normal life
- Freedom from side effects

Classification

1. Barbiturate - Eg. Phenobarbitone
2. Deoxybarbiturate - Eg. Primidone
3. Hydantoin - Eg. Phenytoin
4. Iminostilbene - Eg. Carbamazepine
5. Succinimide - Eg. Ethosuximide
6. Aliphatic carboxylic acid - Eg. Valproic acid
7. Benzodiazepines - Eg. Diazepam

Mechanism of action

- Inhibit generation of action potential by blocking sodium (Na+) channels or calcium (Ca2+) channels, thereby decrease neurotransmission.
- Enhances GABA (Gama aminobutyric acid) inhibition.

Uses: Epilepsy

Antiparkinsonian

Background: Parkinsonism (PD) is a gradually progressive neurodegenerative condition that affects movement. The etiology and pathogenesis remain incompletely understood. The causes could be senile, idiopathic or drug-induced.

Parkinson's disease is a disorder of the central nervous system that is characterized by three cardinal features: (i) bradykinesia (slowness of movement); (ii) muscular rigidity; and (iii) resting tremor that stops upon voluntary movement. Other symptoms that may occur include stooped posture with a characteristic shuffling gait, sialorrhea (hypersalivation or excessive drooling) and dementia during the later stages of the disease

Parkinson's disease is related to an imbalance of dopamine and acetylcholine and a deficiency of dopamine in certain areas of the brain.

Current drug therapy focuses on restoring the balance between these two neurotransmitters.

Definition: These are drugs that have a therapeutic effect in parkinsonism.

There are currently no disease-modifying treatments for PD, and medical management is predominantly focused on controlling the motor symptoms using drugs. Drugs are used to increase Dopamine activity or reduce excitatory interneuron Acetylcholine activity in order to restore their balance.

1. Drugs affecting brain dopaminergic system- Drugs that increase dopamine at receptor sites.

a. Drugs that enhance dopamine activity:
   - i. Dopamine Precursor: Levodopa (Ldopa)
   - ii. Peripheral Decarboxylase Inhibitors: Carbidopa, Benserazide.
   - iii. Dopamine releasers/facilitator: Amantadine.
   - iv. Dopaminergic Agonists: Bromocriptine, Ropinirole, Pramipexole

b. Drugs that inhibit dopamine metabolism:
   - i. Monoamine oxidase B (MAO-B) Inhibitor: Selegiline
   - ii. Catechol-O-methyltransferase (COMT) Inhibitors: Entacapone, Tolcapone

2. Drugs affecting brain cholinergic system – These drugs have a greater affinity for cholinergic receptor sites in the CNS and inhibit the effects of acetylcholine at receptor sites.

a. Central Anticholinergics: Trihexyphenidyl (Benzhexol), Procyclidine, Biperiden.

b. Antihistaminic: Orphenadrine, Promethazine.

Ref: Soltis, Robert P., "Pharmacology of Antiparkinsonian Agents" (1997). Scholarship and Professional Work – COPHS. 251.

Antidepressants

Background: Mood disorders are also called affective disorders. They are a group of psychosis causing mood alteration, this could be mania and depression.

Depression : is defined as a psychoneurotic disorder characterised by mental and functional activity, sadness, reduction in activity, difficulty in thinking, loss of concentration, perturbations in appetite, sleeping, and feelings of dejection, hopelessness and generation of suicidal tendencies. Clinically, both disorders are treated with antidepressants coupled with counselling.

World Health Organisation reports that an estimated 3.8% of the population experience depression, including 5% of adults (4% among men and 6% among women), and 5.7% of adults older than 60 years. Approximately 280 million people in the world have depression. Depression is about 50% more common among women than among men.

The change in mood and behaviour is due to chemical imbalance. Neurotransmitters are the communication link between neurons in the brain. Depression is stated to be caused by a functional deficiency of catecholamines, particularly norepinephrine (NE), The occurrence of depression has been found to be associated with the alterations in the levels of biogenic amines in the brain such as NE, dopamine (DA) and epinephrine, indolamine, serotonin, 5-hydroxytryptamine (5-HT) and two catecholamines.

Definition: Antidepressants are those drugs which help in the reduction in symptoms of depressive disorders by altering chemical imbalances of neurotransmitters in the brain.

Treatment includes psychological treatment and medications.

Mechanism of action: The neurotransmitters such as serotonin, dopamine and noradrenaline or norepinephrine are released by the exonic end of one nerve and received by the other; the phenomenon called as reuptake. The antidepressants inhibit reuptake of neurotransmitters through selective receptors thereby increasing the concentration of specific neurotransmitter around the nerves in the brain.

The antidepressants have been divided into the following groups:

1. Selective serotonin-reuptake inhibitors (SSRIs)- block the reuptake of 5HT and increase synaptic 5HT transmission. Example- Citalopram, Escitalopram
2. Tricyclic antidepressants (TCAs)- block the reuptake of both norepinephrine (NE) and serotonin (5HT). Example- Doxepin, Lofepramine

3. Serotonin-norepinephrine reuptake inhibitor (SNRI)- Example- Desvenlafaxine, Duloxetine.
4. 5-HT2 antagonists- Trazodone, nefazodone
5. Monoamine oxidase inhibitors (MAOIs) - block the activity of monoamine oxidase, an enzyme that breaks down norepinephrine, serotonin, and dopamine in the brain. Example- Isocarboxazid, phenelzine and tranylcypromine
6. Atypical antidepressants- Moclobemide, phenelzine

Side effects of antidepressants include nausea, vomiting, loss of appetite, diarrhoea, sexual dysfunction, headache, weight gain, anxiety, dizziness, dry mouth, and insomnia.

Uses:

- Depression
- Panic attacks
- Post traumatic stress disorder (PTSD)
- Obsessive compulsive disorder (OCD)
- Other anxiety disorders, like Phobias, social anxiety

Ref: Khushboo, Sharma B. Antidepressants: mechanism of action, toxicity and possible amelioration. J Appl Biotechnol Bioeng. 2017;3(5):437-448. DOI:10.15406/jabb.2017.03.00082

Antianxiety

Definition: Anti-anxiety (also termed anxiolytics or anti-panic drugs) are medications that are used to treat anxiety.

Anxiety is an emotional state, unpleasant in nature, associated with uneasiness, discomfort and concern or fear about some defined or undefined future threat. Some degree of anxiety is a part of normal life. The type of anxiety that requires treatment is called generalized anxiety disorder (GAD). This disorder causes excessive worry and anxiety, significant distress, and affects the ability of a person to function. Moreover, the symptoms of anxiety occur on most days for at least six months. Generalized anxiety disorder is treated with psychotherapy and medications.

Antianxiety drugs are ill-defined group of drugs, mostly mild CNS depressants, which are aimed to control the symptoms of anxiety, produce a restful state of mind without interfering with normal mental or physical functions. The anxiolytic-sedative drugs more closely resemble sedative-hypnotics.

Classification of drugs:

1. Benzodiazepines- Diazepam, Chlordiazepoxide, Oxazepam, Lorazepam, Alprazolam

2. Azapirones- Buspirone, Gepirone, Ispapirone
3. Sedative antihistaminic- Hydroxyzine
4. β blocker- Propranolol

In addition to the above drugs, antidepressants, especially the selective serotonin reuptake inhibitors (SSRIs) are effective in obsessive compulsive disorder (OCD), phobias, panic and many types of severe generalized anxiety disorders.

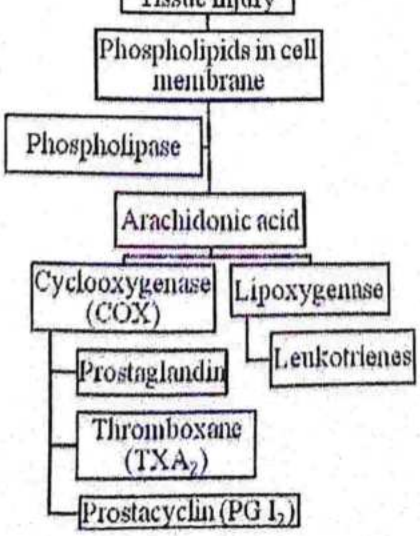
Analgesic

Definition: These are agents that selectively relieves pain (algesia) by acting on the CNS or on peripheral pain mechanisms, without significantly altering consciousness. Analgesics relieve pain as a symptom, without affecting its cause.

Background: *Algeisa (pain)* is an ill-defined, unpleasant sensation, usually evoked by an external or internal noxious stimulus. Pain is the most important symptom as it is a warning signal, primarily protective.

- *Somatic pain:* Well-defined sharp pain arising from skin, muscles, bones, joints which are usually due to inflammation.
- *Visceral pain:* Ill-defined dull acting arising from visceral organs (spasm, ischemia) and accompanied by sweating, nausea, hypotension.
- *Referred pain:* Pain referred to cutaneous area, which has some spinal nerve supply as that of viscera.ă *Acute pain:* Usually well-defined pain due to injury, irritants, ischemia, burns.
- *Chronic pain:* Ill-defined pain, as in cancer pain or neuropathic pain whose perception increases with stress/anxiety.

During inflammation, enzyme phospholipase activates the membrane phospholipids to release arachidonic acid (AA). Cyclooxygenase (COX) enzyme converts AA to prostaglandins (PG).



There are two isoforms of COX, i.e. COX-1 and COX-2. COX-1 is the constitutive form and physiological enzyme, present in most tissues, especially in blood vessels, stomach and kidney. It does physiological 'housekeeping' functions. COX-2 is the inducible form and pathological enzyme only induced during inflammation. This enzyme is responsible for generation of PG locally which mediate many of the inflammatory changes. These PG sensitize nerve endings to bradykinin, histamine leading to hyperalgesia. Thus, drugs inhibiting COX help to decrease pain and inflammation.

- *Opiates*- are drugs derived from Opium (eg. Morphine) a powdered, dried exudate of the fruits of capsule of plant *Papaver somniferum*.
- *Opioids*- are drugs with morphine-like activity that produce analgesia (reduce pain) without the loss of consciousness and can induce tolerance and physical dependence.
- *Opiopeptins*- (eg. g- endorphin) are natural substances of the body that have opioid like activity. These are localized in discrete areas of CNS, and in peripheral tissues including g.i.t, kidney & biliary tract

Classification:

1. Opioid/Narcotic/morphine-like analgesics
   1. Natural opium alkaloids - Eg. Morphine, Codeine
   2. Semisynthetic opiates - Eg. Diacetylmorphine, Ethylmorphine
   3. Synthetic opioids - Eg. Pethidine (Meperidine), Fentanyl, Methadone

   Another type of classification of opioids based on activity are:
   1. Strong opioid agonists - Eg. Hydromorphone, Fentanyl, Sufentanil
   2. Weak opioid agonists - Eg. Codeine, Oxycodone
   3. Mixed agonists-antagonists/partial agonists- Eg. Buprenorphine, Pentazocine
   4. Opioid antagonists - Eg. Naloxone, Naltrexone
2. Non-opioid/non-narcotic/aspirin-like/anti-pyretic or anti-inflammatory analgesics/Nonsteroidal anti-inflammatory drugs (NSAID)
   1. Nonselective COX inhibitors (traditional NSAIDs)
      - i. Salicylates - Eg. Asprin
      - ii. Pyrazolone - Eg. Phenylbutazone
      - iii. Indole acetic acid - Eg. Indomethacin
      - iv. Propionic acid - Eg. Ibuprofen, Naproxen
      - v. Fenamates (Arthanilic acid) - Eg. Mefanamic acid
      - vi. Enolic acid derivatives/Oxicams- Eg. Piroxicam
      - vii. Arylacetic acid - Eg. Diclofenac, Aceclofenac

2. Preferential COX-2 inhibitors
   i. Nimesulide
3. Selective COX-2 inhibitors
4. Analgesic-antipyretics with poor anti-inflammatory action
   i. Para aminophenol derivative- Eg. Paracetamol

Opioid Analgesics

S.N.	Type	Action
1.	Natural opium alkaloids Eg. Morphine, Codeine	Natural opium alkaloids are obtained from opium, which is a dark brown, resinous material from Poppy (*Papaver somniferum*) capsule. Morphine, Codeine are the two important alkaloids obtained from natural opium.Morphine is a prototype. It interacts with opioid receptor as a full agonist. It is a strong anal gesic, especially visceral pain than pain of somatic origin.
2.	Semisynthetic opiates Eg. Diacetylmorphine (Heroin)	These are semisynthetic in origin. These are more potent than morphine, more euphoria but has no outstanding advantage over morphine and has been banned in many countries.
3.	Synthetic opioids Eg. Pethidine, Fentanyl, Methadone, Tramadol	These are of synthetic origin. Though chemically unrelated to morphine, it interacts with opioid receptors.

Pure opioid antagonists- These are competitive antagonist on all types of opioid receptor. Naloxene, a pure opioid antagonist, is the drug of choice for morphine poisoning) 0.4-0.8mg i.v. every 2- 3 min; max 10mh)

Uses: Opioid analgesics

1. As analgesic- indicated in severe pain of any type.
2. Preanaesthetic medication
3. Balanced anaesthesia- Fentanyl, Pethidine
4. Relief of anxiety
5. Acute left ventricular failure
6. Cough
7. Diarrhoea

2. Non-opioid/non-narcotic/aspirin-like/anti-pyretic or anti-inflammatory analgesics/Nonsteroidal anti-inflammatory drugs (NSAID)- Refer 11.3

11.2 Drugs Acting on Peripheral (somatic) Nervous System: Skeletal Muscle Relaxants, Local Anaesthetics

11.3 Autacoids and Related Drugs: Nonsteroidal Anti-inflammatory (NSAIDs)/ Antipyretic and Analgesics Drugs

Autacoids

Autacoids- The word "Autacoid" is derived from Greek word 'autos' meaning self and 'akos' meaning remedy. These are formed in various tissues and have diverse physiological and pathological roles. They are synthesised and act locally and hence they are called local hormones.

For example:

- Amine autacoids- Histamine, 5- hydroxytryptamine
- Peptide autacoids- Angiotensin, kinins
- Phospholipid-derived autacoids- Prostaglandins, leukotrienes, platelet-activating factor (PAF)

Antihistaminics

Background: Histamine, meaning 'tissue amine' (*histos*- tissue) is almost universally present in animal tissues and in certain plants. Histamine is present mostly within storage granules of mast cells. Histamine is found rich in skin, gastric and intestinal mucosa, lungs, liver and placenta. Nonmast cell histamine occurs in brain, epidermis, gastric mucosa.

Histamine releasers: A variety of stimuli are capable of releasing histamine from mast cells, Antigen- antibody reaction, insect stings, animal foods, and certain drugs.

Histamine receptors: Histamine acts on four subtypes of histamine receptors; H_1, H_2, H_3, H_4

Actions of Histamine:

Type	Distribution in the body	Actions
H_1	Smooth muscle of intestine, airway, endothelium of blood vessels, afferent nerve endings and brain	Contraction of smooth muscle, vasodilatation, sensory nerve endings pain and itching- for emesis
H_2	Gastric glands, smooth muscle of blood vessels, heart, brain	Gastric secretion, vasodilatation

H_3	Presynaptic sites in the brain, ileum, lung, spleen, skin	Decrease histamine release, decrease secretions, vasodilatation
H_4	Eosinophils, neutrophils	

Definition: These are drugs which competitively block H1 receptors and antagonize actions of histamine.

Classification

1. First generation
   - Eg. Diphenhydramine, Promethazine
2. Second generation
   - Eg. Cetrizine, Pheniramine
   - The second generation drugs have one or more of the following properties:
   - Absence of CNS depressant property
   - No anticholinergic effects

Uses

1. Allergic disorders: Prevention & treatment of symptoms, like in allergic rhinitis, allergic conjunctivitis, urticarial, pruritus, allergic skin disorders
2. Common cold: It reduces rhinorrhea and produces only symptomatic relief but cause drowsiness.
3. Cough: It is useful in cough by decreasing post nasal drip. It is not effective in productive cough, as it causes mucus thickening and makes it difficult to expectorate.
4. Antiemetic- in motion sickness, postoperative nausea/vomiting (Ref: ANTI EMETIC)
5. Peptic ulcer- (Ref: ANTI ULCER)
6. Vertigo

Nonsteroidal Anti-inflammatory Drugs (NSAID)

These are also called as non-opioid/non-narcotic/aspirin-like/anti-pyretic or anti-inflammatory analgesics

S. N	Type	Action
1.	**Nonselective COX inhibitors**	These drugs inhibit both forms of COX.
i.	SalicylatesEg. Asprin	- These are salts of salicylic acid and Aspirin is a prototype. - One of the oldest analgesic-anti-inflammatory drug.

		- A weak analgesic, effectively reduces inflammation, tissue injury related pain but ineffective in relieving vague, visceral pain.
ii.	Pyrazolone Eg. Phenylbutazone	- These are potent anti-inflammatory, weak analgesic, antipyretic - Since they are more toxic, it's banned in some countries.
iii.	Indole acetic acid Eg. Indomethacin	- These have potent anti-inflammatory, good analgesic & with antipyretic action - It relieves only inflammatory or tissue injury related pain.
iv.	Propionic acidEg. Ibuprofen, Naproxen	- It has lower analgesic, antipyretic & anti-inflammatory efficacy than aspirin. - It is used as a simple analgesic & antipyretic. - Widely used in Rheumatoid arthritis (RA), Osteoarthritis (OA), especially where pain is more prominent than inflammation.
v.	Fenamates (Arthanilic acid) Eg. Mefanamic acid	- It is a potent analgesic, antipyretic and weaker anti-inflammatory. - It exerts both peripheral and central actions. - Indicated primarily as analgesic in muscle, joint & soft tissue pain where strong anti-inflammatory is not required.
vi.	Enolic acid derivatives/Oxicams Eg. Piroxicam	- It has good analgesic antipyretic & anti-inflammatory action. - It is a reversible inhibitor of COX, lowers PG concentration in synovial fluid & inhibits platelet aggregation
vii.	Aryl-acetic acid Eg. Diclofenac, Aceclofenac	- Diclofenac- An analgesic- antipyretic- anti-inflammatory drug - It is slightly COX-2 selective inhibitor. - Useful in acute musclo-skeletal pain
2.	**Preferential COX-2 inhibitors**	These agents are moderately COX-2 selective inhibitors
i.	Nimesulide	- Used primarily for short- lasting painful inflammatory conditions-Banned due to its adverse effects

3.	**Selective COX-2 inhibitors** Eg. Celecoxib	- These agents are selective inhibitor of COX-2 and hence does not affect COX-1 functions. Hence cause little gastric mucosal damage, do not prolong bleeding time. - As they inhibit PGI2 production, there is increased risk of cardiovascular re and cerebrovascular thrombotic events.
4.	**Analgesic-antipyretics with poor anti-inflammatory action**	
i.	Para aminophenol derivative Eg. Paracetamol	Paracetamol (Acetaminophen)- good antipyretic, analgesic with negligible anti-inflammatory

Uses: Non- Opioid analgesics- Choice of Non-opioid/NSAIDs is usually empirical. Considering the cause/nature of pain, presence/absence of inflammation, age, side-effects, condition helps to decide the appropriate NSAID.

1. Mild- moderate pain with little inflammation
2. Acute musculoskeletal pain
3. Pain in Rheumatoid arthritis
4. Pain in Osteoarthritis
5. Sports injury
6. Pain in Dysmenorrhea
7. Fever

Antiinflammatory

Definition: The agents which reduce inflammation.

Background: *Inflammation:* It is a biological response of vascular tissues to harmful stimuli, such as pathogens, damaged cells, or irritants.

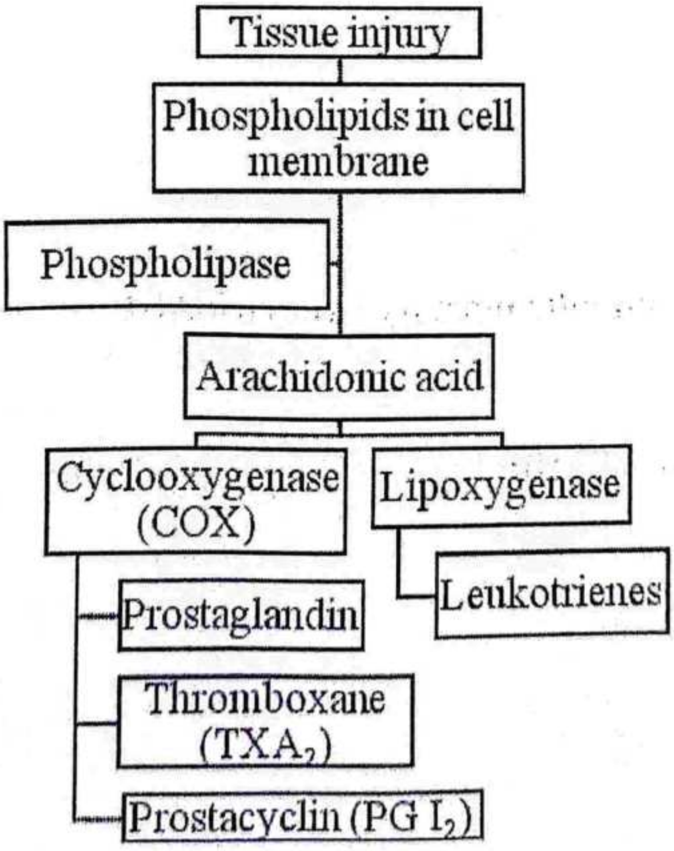
Signs of inflammation

- Redness- Due to vasodilation by effects of releasing histamine, bradykinin and prostaglandin.
- Hotness- Due to increased blood flow
- Swelling- Due to increased vascular permeability by the released mediators and increased exudate in the inflamed area
- Pain- Due to irritation of nerve ending by inflammation and the pressure of the swelling on the nerve ending.

Inflammatory mediators

1. Histamine
2. 5-HT (serotonin)
3. Bradykinin
4. Prostaglandins (PG) - main inflammatory mediator
5. Interleukines
6. Substance P
7. Nitrous oxide

During inflammation, enzyme phospholipase activates the membrane phospholipids to release arachidonic acid (AA). Cyclooxygenase (COX) enzyme converts AA to prostaglandins (PG).



There are two isoforms of COX, i.e. COX-1 and COX-2. COX-1 is the constitutive form and physiological enzyme, present in most tissues, especially in blood vessels, stomach and kidney. It does physiological 'housekeeping' functions. COX-2 is the inducible form and pathological enzyme only induced during inflammation. This enzyme is responsible for generation of PG locally which mediate many of the inflammatory changes.

Hence targeting the enzymes which are responsible for the generation of inflammatory mediators are the aim of anti-inflammatory drugs.

Classification

1. Steroidal Anti-inflammatory Drugs
2. Non-steroidal Anti-inflammatory Drugs

Steroidal Anti-inflammatory Drugs: These are agents that contain steroid moiety in their structure.

Glucocorticoids (GC): Glucocorticoids are of two types:

1. Natural- Eg. Cortisone, Hydrocortisone
2. Synthetic- Eg. Betamethasone, Dexamethasone

Mechanism of action: These steroidal anti-inflammatory drugs act by direct inhibition of the enzyme Phospholipase A which activate synthesis of arachidonic acid with subsequent formation of prostaglandins (PG). They include synthesis of a protein "lipocortin-1" which has inhibitory effect on phospholipase A_2.

Side effects

1. Immunosuppression
2. Redistribution of body fat- moon face, buffalo hump
3. Muscle breakdown(proteolysis), weakness

Non-steroidal anti-inflammatory Drugs (NSAID): These agents do not contain steroid moiety. They also have analgesic & antipyretic activity along with anti-inflammatory effect.

Classification of NSAID: (Refer ANALGESICS for description)

1. Selective COX-2 inhibitors
2. Non selective COX inhibitors
3. Preferential COX-2 inhibitors

Mechanism of action: NSAID inhibit synthesis of prostaglandins (PG) which are the main factor in inflammation. They inhibit PG through inhibition of cyclooxygenase (COX) enzymes which are responsible for production of prostaglandins (PG).

Antipyretic

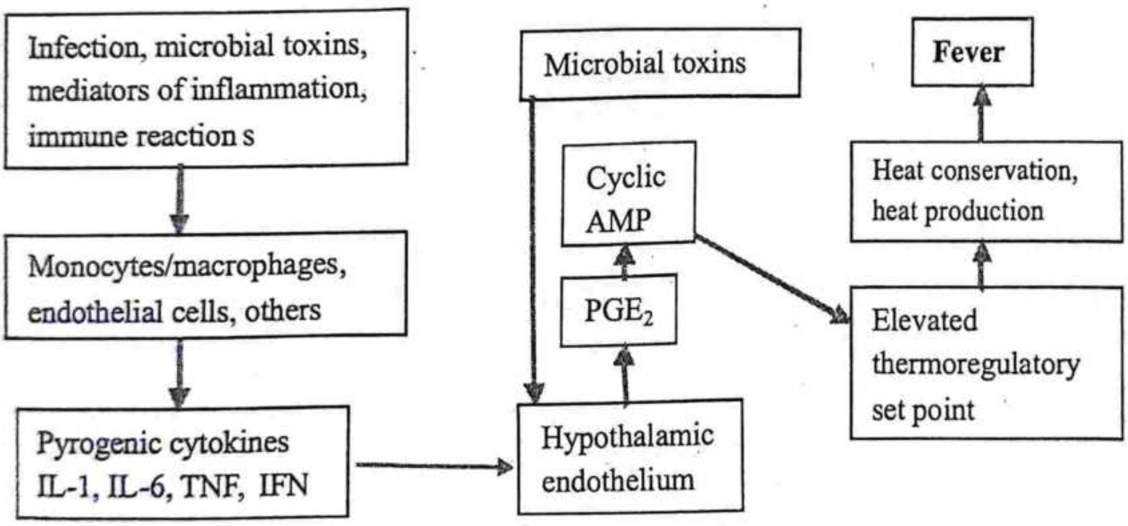
Definition: These are agents that reduce fever by lowering the body temperature.

Background: The average normal temperature is generally considered to be between 36.6°C- 37°C (98.0°F- 98.6°F) when measured orally.[4]

Pyrexia: Fever, which means a body temperature above the usual range of normal, can be caused by abnormalities in the brain itself of by toxic substances that affect the temperature-regulating centers.

Body temperature regulation: Body temperature is controlled by the hypothalamus, which receives two kinds of signals: one from peripheral nerves that reflect warmth/cold receptors and the other from the temperature of the blood bathing the region. These two types of signals are integrated by the thermoregulatory center of the hypothalamus to maintain normal temperature. A normal body temperature is ordinarily maintained, despite environmental variations, because the hypothalamic thermoregulatory center balances the excess heat production derived from metabolic activity in muscle and the liver with heat dissipation from the skin and lungs.

Chronology of events required for the induction of fever:[5,6]



Hence, drugs which inhibit this process would be a potential antipyretic drug.

The classification of drugs described under NSAID in Analgesic are contribute to antipyretic action. (Refer ANALGESIC).

Examples: Acetaminophen (paracetamol), Aspirin and other NSAID

Mechanism of action: The principal action of antipyretics rests in their ability to inhibit the enzyme cyclooxygenase (COX) and interrupt the synthesis of inflammatory prostaglandins.

Uses: Fever

11.4 Drugs for Respiratory Disorders: Bronchodilators, Aerosols/ Inhalants, Expectorants, Antitussive Drugs

Bronchodilators

Definition: These are agents which relax the smooth muscles in the airway, thus widens the airways and makes breathing easier.

Classification:

1. β_2 sympathomimetics- Eg. Salbutamol
2. Methylxanthines- Eg. Theophylline
3. Anticholinergics- Ipratropium bromide

S.N	Type	Mechanism of action	Use
1.	β_2 sympathomimetics	These agents stimulate β2 receptors in bronchial smooth muscle, which leads to increased cAMP formation and thereby bronchodilation.	Most commonly used agents since they have a rapid onset, are safe and convenient.
2.	Methylxanthines	These agents inhibit phosphodiesterase, hence increases cAMP formation and thereby bronchodilation.	Acute attack, Chronic asthma
3.	Anticholinergics	These agents cause bronchodilation by blocking M_3 receptor mediated cholinergic constrictor tone.	Chronic bronchitis, chronic obstructive pulmonary diseases (COPD)

Aerosols/inhalants

Definition: These are a type of dosage form which is aimed at delivering the drug to the site of action so that lower dose is required and systemic side effects are minimized.

Advantages

1. Aerosols have reduced risk of systemic side effects.
2. β_2- agonists, corticosteroids, ipratropium bromide and cromoglycate are used as inhalation.
3. Faster action of bronchodilators can be achieved compared to oral administration

Types

1. Pressurized metered dose inhaler (PMDI) - Hydrofluroalkane (HFA) propellants are pressurized aerosols which deliver a specified dose of drug in spray form for actuation. They are economical & portable. Its use requires proper breathing coordination.
2. Nebulizers-These produce a mist of the drug solution generated by pressurized air or oxygen which can be inhaled through a mouth piece, face mask or in a

tent. This does not require breathing coordination. It is used in sever bronchospasm.

3. Rotacaps- These are dry powder inhalation, which requires deep and forceful inspiration. It is not suitable for children, elderly, very sick as it requires high velocity inspiration. Dry powder may irritate air passage causing cough & bronchoconstriction.

Expectorants

Definition: Expectorants are drugs believed to increase bronchial secretion or reduce its viscosity, facilitating its removal by coughing.

'Expectorare' means to drive from chest. They increase respiratory secretions and covers the irritated mucosa. They also make the secretions thin and less viscid, which makes it easy to be coughed out.

Classification

1. Direct stimulants- These agents increase secretions directly when given as inhalation. Eg. Eucalyptus oil, alcohol or cedar wood oil.
2. Reflex expectorants- These agents are gastric irritants and increase the respiratory secretions through reflex action.

Uses: Cough

Antitussives

Definition: Antitussives are drugs that suppress the cough reflex.

Coughing is a naturally protective way to clear the airway of secretions or any collected material. Persistent coughing can be exhausting and can cause muscle strain and further irritation of the respiratory tract. Many disorders of the respiratory tract are accompanied by an uncomfortable, unproductive cough.

Antitussives act on the cough-control center in the medulla to suppress the cough reflex or act peripherally in the respiratory tract to reduce tussal impulses or both these actions.

As antitussives aim to control rather than eliminate cough, it should be used only for nonproductive and irritating or if cough is unduly tiring, disturbs sleep or is hazardous (hernia, piles, cardiac disease, ocular surgery)

Adverse effects

Adverse effects from the use of antitussives include drowsiness, sedation, nausea, constipation, dry mouth.

Central cough suppressants

1. Opioids- Example- Codeine, hydrocodone. It decreases sensitivity of the central cough center to peripheral stimuli and decrease mucosal secretions. These agents produce constipation, nausea and respiratory depression. To better avoid in children.

Type	Action
Codeine	• Suppress cough center • To be avoided in children • Side effect is drowsiness, nausea, constipation
Noscapine	• Suppress cough center • Useful in spasmodic cough • Side effect is headache, nausea
Dextromethorphan	• An opioid isomer • Central NMDA (N-methyl D-aspartate) receptor antagonist
Antihistamines	• H1 antihistamines afford relief in cough due to their sedative and anticholinergic action, but lack selectivity for cough center • Like, Promethazine, Diphenhydramine
Peripherally acting antitussive	• Acts peripherally, desensitizes pulmonary stretch receptors and reduces tussal impulses originating in the lungs • Indicated in cough of bronchial origin

11.5 Cardiovascular Drugs: Antihypertensive, Antianginal Drugs

Antihypertensive

Background: *Blood pressure* (BP): Blood pressure is defined as the tension exerted by the blood on the walls of the arteries.

It is determined by cardiac output (CO) and total peripheral resistance (TPR- resistance to passage of blood through pre-capillary arterioles)

Regulation of BP: Blood pressure is regulated by Baroreflex (autonomic nervous system), neural (sympathetic nervous system), renin- angiotensin-aldosterone system.

Renin- angiotensin-aldosterone system: Renin is an enzyme, secreted by juxtaglomerular cells of kidney in response to reduced arterial BP, reduced Na+ and increased sympathetic activity. Renin acts on Angiotensinogen, and converts into Angiotensin-I, which is rapidly converted by Angiotensin converting enzyme (ACE) into Angiotensin-II. Angiotensin-II acts on two receptors AT1, AT2 to produce vasoconstriction, Na+, water retention and thus restore the reduced blood pressure.

Hypertension: JNC 7(2003) & WHO-ISH guidelines (2003) have defined Hypertension to be 140mm Hg systolic and 90 mm Hg diastolic.

Types of Hypertension:

1. Essential (Primary) hypertension- The cause is not known
2. Secondary hypertension- caused secondary to either renal, endocrine or vascular causes.

The aim of antihypertensive drugs are to reduce the cardiac output or/and total peripheral resistance by acting on the regulatory system of blood pressure.

Definition: These are drugs used to lower blood pressure in Hypertension.

Classification

1. Diuretics- Eg. Loop diuretics- Furosemide; Thiazides- Hydrochlorothiazide
2. Angiotensin- converting enzyme inhibitors (ACEIs)- Eg. Captopril
3. Angiotensin II receptor blockers/Antagonists (ARBs)- Eg. Losartan
4. g adrenergic blockers- Eg. Atenolol
5. g and í adrenergic blockers- Eg. Carvedilol
6. í adrenergic blockers- Eg. Prazosin
7. Calcium channel blockers- Eg. Amlodipine
8. Central sympatholytics- Eg. Methyldopa
9. Vasodilators- Eg. Nitroprusside

S.N.	Type	Mechanism of action
1.	Diuretics	These agents increase excretion of Na and water, thus decrease plasma volume, reducing cardiac output and hence decreases BP.
2.	Angiotensin- converting enzyme inhibitors (ACEIs)	These agents inhibit production of angiotensin II and aldosterone, thus decreases BP.
3.	Angiotensin II receptor blockers/Antagonists (ARBs)	These agents inhibit the AT1 receptors of Angiotensin II and thus decrease BP.
4.	β adrenergic blockers	These agents block β 1 receptors, thereby decreases cardiac contractility, thus reduces cardiac output, decreasing BP. (Refer 'A brief review on Central Nervous System)
5.	β and α adrenergic blockers	These agents blocks both α and β receptors, leading to dilation of arterioles and veins and decrease heart

		rate. The net effect is reduction in blood pressure.
6.	α adrenergic blockers	These agents block α adrenergic receptors, leading to vasodilation, thus reducing BP.
7.	Calcium channel blockers	These agents inhibit calcium ions entry, thus causes arteriolar dilation, leading to decreased peripheral resistance and reducing BP.
8.	Central sympatholytics	These are selective í2 adrenergic agonist. It inhibits sympathetic nerve activity, thus inhibiting the release of norepinephrine, leading to peripheral vasodilation and thus lowers BP.
9.	Vasodilators	These agents relax vascular smooth muscles, thereby reducing peripheral resistance and thus lowers BP.

Uses

Hypertension

Antianginal

Background: *Angina pectoris:* It is a pain syndrome due to induction of an adverse oxygen supply/demand situation in a portion of the myocardium. It is characterized as sudden, severe, retrosternal discomfort/pain with/without radiation to left shoulder/or left arm and is one of the chief symptom of ischemic heart disease (IHD).

Types

a. *Classical/Stable angina:* This is the commonest form and the attacks are predictable. Due to an arteriosclerotic affliction of larger coronary artery, blood flow fails to increase during an increased demand, leading to ischemic pain. It is provoked by exercise, emotion as these increase oxygen demand. It subsides when the increased oxygen demand is withdrawn.

b. *Variant/ Prinzmetal's angina:* This is the uncommon form and attacks are unpredictable. It is caused due to recurrent localized coronary vasospasm, leading to imbalance between oxygen demand and supply. Drugs are aimed at preventing and reliving coronary vasospasm.

c. *Unstable angina:* Pain occurs at rest and there is increased frequency and duration of angina attacks. This is caused due to rupture of atheromatous plaque leading to platelet deposition in coronary artery, leading to progressive coronary thrombosis.

Antianginals should restore the balance between oxygen supply and demand by either increasing oxygen supply by coronary vasodilation or decrease demand by reduc-

ing preload/afterload/heart rate or all of these.

Definition: These are the agents that prevent, abort or terminate attacks of Angina pectoris.

Antianginal drugs relieve cardiac ischemia but do not alter the course of coronary artery pathology and no permanent benefit is afforded.

Classification:

1. Nitrates- Eg. Nitroglycerin
2. β blockers- Eg. Propranolo, Atenolol
3. Calcium channel blockers- Eg. Amlodipine, Verapamil
4. Potassium channel opener- Eg. Nicorandil
5. Others- Eg. Aspirin, Dipyridamole

S.N.	Type	Mechanism of action
1.	Nitrates	These agents causes vasodilatation of vascular smooth muscles, leading to peripheral pooling of blood, thereby reducing preload. It also causes arte riolar dilation, thus decreasing peripheral resistance, thereby decrease afterload. The net effect of these leads to decreased workload on heart, thereby de crease oxygen demand.
2.	β blockers	These agents block β_2 receptors, reducing coronary flow and thereby reduce cardiac work.
3.	Calcium channel blockers	These agents inhibit calcium ions entry, thus causes arteriolar dilation, leading to decreased peripheral resistance, thereby decrease afterload. Hence decrease cardiac work, decrease oxygen demand.
4.	Potassium channel opener	These agents increase flow of potassium ions, thus lead to arteriolar and venous dilatation, leading to decrease workload.
5.	Others	Aspirin is used for prevention of MI

11.6 Drugs Acting on Kidney: Diuretics

Diuretics

Background:[4] Kidney has one of the major regulatory and excretory functions, Nephron is the functional unit of kidney with regulatory, excretory, hormonal and normal

glomerular filtration functions. In a normal glomerular filtration, 180L/day is filtered, of which 99% is reabsorbed. And 1-1.5L/day urine is the normal output.

The processes involved in urine formation are Glomerular filtration, tubular reabsorption and active tubular secretion.

For a better understanding of diuretics, a thorough understanding of the tubules of nephron and its role in urine formation is necessary.

- **Proximal convoluted tubule(PCT):** This portion of the nephron reabsorbs 100% glucose, 85% sodium bicarbonate, 65% sodium (Na), potassium (K), calcium (Ca) and magnesium (Mg).Chloride is passively transported along with Na. Water is reabsorbed proportionately to maintain isotonic tubular fluid. Na is transported by four ways- Na^+/H^+ exchanger/ Na^+ -H^-antiporter, direct entry, Na^+ and K^+ transport along with glucose amino acids and phosphates and specific symporters. Certain osmotic diuretics and Aldosterone antagonists act at PCT.
- **Loop of Henle:** The thin descending limb of the loop is impermeable to Na. Water is absorbed by osmotic forces. Osmotic diuretics also act here. In the thick ascending limb, 25% of Na, Cl- is reabsorbed by $Na^+/2Cl$ cotransporter. Water is not reabsorbed t this juncture. Loop diuretics block $Na^+/K^+/2Cl$ cotransporter and hence decreases NaCl reabsorption.
- **Distal convoluted tubule and collecting duct:** In the early distal convoluted tubule, 10% NaCl is reabsorbed by Na^+ Cl cotransporter/symporter and is impermeable to water. Thiazide group of drugs block this transporter. In the later distal tubule and collecting duct, Na is actively reabsorbed while Cl and water diffuse passively. K^+ is secreted in exchange of Na^+. This is controlled by Aldosterone. K^+ sparing diuretics act here

Definition: Diuretics (Natriuretics) are drugs which cause a net loss of sodium ions (Na^+) and water in urine. Most diuretics act by decreasing the rate of sodium reabsorption from the tubules, which in turn causes natriuresis (increased sodium output) and this in turn causes diuresis (increased water output). That is, increased water output, in most cases, occurs secondary to inhibition of tubular sodium reabsorption because sodium remaining in the tubules acts osmotically to decrease water reabsorption

Classification of Diuretics:

1. High ceiling diuretics(Loop diuretics)- These are inhibitors of $Na^+K^+2Cl^-$ cotransport- Sulphamoyl derivatives- Furosemide, Torasemide
2. Medium efficacy diuretics – These are inhibitors of Na^+ Cl^- symport

a. Benzothiadiazines (Thiazides)- Hydrochlorothiazide

b. Thiazide like – Chlothalidone, Clopamide

3. Weak or adjunctive diuretics

a. Carbonic anhydrase inhibitors- Acetazolamide

b. Potassium sparing diuretics- Aldosterone antagonist- Apironolactone

c. Osmotic diuretics- Mannitol, Isosorbide

S.N.	Type	Mechanism of action	Uses
1.	High ceiling diuretics (Loop diuretics)	These are absorbed by GI tract and are eliminated by filtration and tubular secretion. They inhibit active NaCl reabsorption in the thick ascending limb of the loop of Henle by inhibiting $Na^{+}K^{+}2Cl^{-}$ cotransport. This increases water and electrolyte excretion. They also reduce reabsorption of Cl^{-} & Na^{+} and increase Ca^{2+} excretion.	CHF- Edema, Hypertension, Hypercalcemia
2.	Thiazides	These are absorbed from the GI tract and secreted into the lumen of the proximal tubule (PCT). They inhibit active reabsorption of NaCl in distal convoluted tubule by interfering with $Na^{+}Cl^{-}$ cotransporter, resulting in net Na^{+} and water excretion. Also decrease Ca^{2+} excretion and increases excretion of Cl^{-}, Na^{+} and HCO_3^{-}	Thiazide- Essential hypertension,
3.	Carbonic anhydrase inhibitors	They are absorbed from GI tract and are secreted by proximal tubule. They inhibit carbonic anhydrase in all parts of the kidney, predominantly proximal tubule of kidney and also reduce reabsorption of HCO_3 and Na^{+} uptake.	Acetazolamide- Glaucoma, to alkalinize urine
4.	Potassium sparing diuretics	Aldosterone antagonists and renal epithelial Na^{+} channel inhibition indirectly conserve K^{+} while inducing mild natriuresis in the distal part of the nephron (collecting tubule)	Spironolactone- Used in combination with thiazides- in the treatment of Hypertension, CHF, refractory edema.
5.	Osmotic diuretics	These agents are easily filtered, poorly reabsorb able solutes that alter the diffusion of water relative to sodium by binding	Mannitol- Prophylaxis of acute renal failure resulting

		water. As a result, net absorption of Na^+ is reduced.	from trauma. to reduce cerebral edema, intraocular pressure

Antidiuretics

Background: *Antidiuretic Hormone (Vasopressin)* – is a hormone secreted by posterior pituitary along with oxytocin. It regulates the rate of water excretion into the urine and in this way helps control concentration of water in the body fluids. The two main physiological stimuli for ADH release are rise in plasma osmolarity and reduction of e.c.f (extracellular fluid) volume.

Diabetes insipidus (DI) - is a part of a group of hereditary or acquired polyuria and polydipsia diseases. It is associated with inadequate vasopressin or ADH secretion or renal response to vasopressin, resulting in hypotonic polyuria and a compensatory polydipsia. Polyuria (>50ml/kg), dilute urine (osmolality <300mOsm/L), and increased thirst (water intake of up to 20L/day) are characteristic of DI.[11]

DI can be caused by two fundamentally different defects :

- Inadequate/ impaired secretion of vasopressin from the posterior pituitary gland
- Impaired/insufficient renal response to vasopressin.

Types of DI-

- *Central DI (neurogenic DI)* is the most common form of DI, occurring in both the sexes equally and at any age. It is caused by inadequate synthesis/release of ADH
- *Nephrogenic DI-* This type, results from the failure of the kidney to respond to ADH. Urine production in patients with NDI is typically 12L/day. Children usually present with the inherited form whereas adults present with the acquired form.

Definition: Antidiuretics (more precisely 'anti-aquaretics', because they inhibit water excretion without affecting salt excretion) are drugs that reduce urine volume, particularly in diabetes insipidus (DI) which is their primary indication.

Drugs are :

1. Antidiuretic hormone (ADH, Vasopressin) –
2. Vasopressin analogues- Desmopressin, Terlipressin.
3. Thiazide diuretics-Amiloride.
4. Miscellaneous: Indomethacin, Chlorpropamide, Carbamazepine

Uses:

1. Diabetes insipidus
2. Nocturnal enuresis

Lithotriptic

Definition: An agent that dissolves stones.

Background: Nephrolithiasis is defined as the occurrence of stones in the collecting system of the kidney. Renal calculi are crystalline structures composed most commonly of calcium oxalate salts.

Urine contains various solutes dissolved in water. The concentration of urine changes depending on the amount of water and the solutes. When the concentration of solutes in urine increases, it reaches a state of saturation. Saturation is the point at which the water and the minerals dissolved in the urine are in equilibrium and precipitation does not occur below this level. Further increase in solute load leads to super saturation. Super saturation is the level, beyond which addition of further solute invariably results in crystallization. The stage between saturation and super saturation is the metastable zone. In this stage, crystallization occurs if other factors are favorable. Risk factors for super saturation include dehydration, high fat diet, animal protein, high salt intake and obesity.

Mainly six types of stones are found as :

- Calcium oxalate containing stone
- Calcium phosphate containing stone
- Cystine containing stone
- Uric acid stone
- Xanthine containing stone
- Struvite containing stone

Main causes of nephrolithiasis are hypercalciuria, hyperoxaluria, hypocitraturia, hyperuricosuria, hypomagnesuria etc.[12]

Lithotripsy: The application of physical force of sound waves to crush a stone in the bladder or urethra.

Management

1. Patients with hypercalciuria benefit from treatment with Thiazides diuretic combined with potassium citrate. Thiazides decrease calcium excretion in urine.
2. The administration of citrate or citrus fruits is also beneficial in patients with hypocitraturia.
3. Hyperuricosuria is commonly encountered in patients with stone disease. If

hyperuricemia and uricosuria are present, Allopurinol 200-300mg a day combined with potassium citrate is given so as to maintain an alkaline urine pH.[13]

11.7 Drugs Affecting Blood: Haematinics, Coagulants, Anticoagulants, Hypolipidaemic Drugs

Haematinics

Definition:

Background: The major function of red blood cells, also known as *erythrocytes*, is to transport *hemoglobin*, which in turn carries oxygen from the lungs to the tissues.

Hemopoiesis: It is the process of production, differentiation, maturation of red blood cells in the body

Regulation of red blood cell production: The total mass of red blood cells in the circulatory system is regulated within narrow limits, so that an adequate number of RBC is always available to provide sufficient tissue oxygenation and yet so that cells do not become so concentrated that they impede blood flow.

1. The principal factor that stimulates red blood cell production is a circulating hormone, *erythropoietin*. Factors that decrease tissue oxygenation, like low blood volume, anemia, low hemoglobin, poor blood flow, high altitude stimulates erythropoietin production and in turn enhances RBC production.
2. Another factor are two vitamins, vitamin B_{12} and *folic acid*, which are vital for final maturation of red blood cells. The lack of either of these two vitamins, lead to failure of cell maturation and division, thereby leading to abnormal red blood cell shapes and increased cell membrane fragility.
3. *Iron* is important for formation of hemoglobin. Decreased iron, leads to reduced formation of hemoglobin in the bone marrow. This in turn, reduces the RBC volume in the blood and also the ability to transport optimum oxygen to the tissues.[4]

Daily requirements: Vitamin B_{12}: 1-3 $\bar{g}$

Folic acid : 0.2mg

Iron : (Adult male: 0.5-1mg; Adult female: 1-2mg)

Anemia: means a deficiency of red blood cells, which can be caused by either too rapid blood loss or too slow production of red blood cells.

Causes of Anemia:

- Decreased RBC formation due to decrease in essential nutrients, e.g. iron, folic acid, vitamin B_{12}
- Increased destruction of RBC, e.g. hemolytic anemia, sickle cell anemia
- Erythropoietin deficiency
- Bone marrow depression due to radiation, toxins or drugs
- Increased blood loss

Hematinic: These are agents required in the formation of blood and are used for the treatment of anemias.

1. Iron: Iron absorption occurs in the upper part of the intestine.

Preparations: Oral iron- preferred route of iron administration is oral, in the form of ferrous sulphates.

Uses: Iron deficiency anemia, Megaloblastic anemia after evaluation, as prophylaxis in pregnant.

2. Vitamin B_{12}: Vit B_{12} is present in food as protein conjugates and is released by cooking or by proteolysis in stomach facilitated by gastric acid. Absorption of Vitamin B12 is facilitated by the intrinsic factor secreted by stomach.

Dietary source: liver, egg yolk, meat, fish, cheese, pulses

Preparations: Parenteral Vit B_{12} is a must when deficiency is due to lack of intrinsic factor or other gastric causes.

Uses: Treatment of Vit B_{12} deficiency, as prophylaxis and neuropathies

3. Folic acid: Folic acid present in food is split off primarily in upper intestine and absorbed.

Dietary source: green leafy vegetables especially spinach, liver, fruits, yeast, egg, milk

Preparations: Liquid oral preparations and injectable are available in combination formulation.

Uses: Megaloblastic anemia, as prophylaxis during pregnancy

4. Erythropoietin: It is a hematopoietic growth factor, which stimulate growth and differentiation of blood cells. It is synthesized by peritubular interstitial kidney cells. It increases red cell production, by acting on erythropoietic stem cells.

Preparations: As intravenous or subcutaneous

Uses: Anemia of chronic kidney disease, anemia due to anticancer drugs, chronic inflammation.

Coagulants

Background: Hemostasis and blood coagulation: Hemostasis means prevention of blood loss. When blood vessels are ruptured, clotting mechanism arrest bleeding.

The clotting mechanism is broken into 2 stages:

1. Primary hemostasis: formation of a weak platelet plug, which is achieved in four phases, vasoconstriction, platelet adhesion, platelet activation and platelet aggregation.

2. Secondary hemostasis: stabilizing the weak platelet plug into a clot by the fibrin network. This involves the clotting factors acting in a cascade to ultimately stabilize the weak platelet plug. This is accomplished by completing three tasks: (1) Triggering activation of clotting factors, (2) Conversion of prothrombin to thrombin, and (3) conversion of fibrinogen to fibrin. These tasks are accomplished initially by one of the two pathways: the extrinsic and intrinsic pathway, which converge and then complete via common pathway.

Calcium ions are required for the entire process of secondary hemostasis. Vitamin K is necessary for synthesis of clotting factors.[7]

Definition: These are agents which arrest bleeding and promote coagulation and are indicated in hemorrhagic states. They are also called as Hemostatic agents.

Classification:

1. Local agents- Also called as Styptics (Explanation under the heading of STYPTICS)
2. Systemic agents
   a) Vitamin K
   b) Fibrinogen
   c) Fresh plasma/Whole blood
   d) Others- Ethamsylate, Desmopressin

a) Vitamin K: It is a fat soluble vitamin, necessary for synthesis of clotting factors, with an average daily intake of 70-140mg/day. It requires bile to absorb from intestine.

Dietary source: spinach, cabbage, cauliflower, meat, liver, milk, butter

Preparations: Vitamin K are available as oral, SC, IM and IV injectable.

Uses: Prophylaxis and treatment of bleeding associated with Vitamin K deficiency, other hemorrhage associated conditions.

b) Fibrinogen: It is sourced from pooled human plasma.

Uses: Hemophilia

c) **Fresh plasma/Whole blood:** they contain all clotting factors.

d) **Ethamsylate:** It normalizes platelet adhesion. It is used in PPH, Menorrhagia, epistaxis

Desmopressin: It normalizes bleeding time. It is used in Hemophilia, and NSAID induced bleeding.

Styptics

Definition: These are substances used to stop bleeding from a local approachable site. They are particularly effective on oozing surface or bleeding from capillaries and small blood vessels e.g. tooth socket, small wound, and epistaxis. These agents should never be injected.

1. Thrombin:
   - It is freeze dried powder obtained from bovine/human plasma.
   - Dusted over the bleeding surface
   - Use- Hemophilia, skin grafting
2. Fibrin:
   - It contains fibrinogen, thrombin, calcium and other clotting agents obtained from human plasma.
   - Available as sheets/spray
3. Gelatin:
   - It is absorbable hemostatic protein
   - Left in place after suturing wound, being porous and spongy, it provides physical meshwork on which clotting occurs.
   - Absorbed in 1-2 months.
4. Astringents:
   - It precipitates local proteins at bleeding site.
   - Tannic acid, ferric chloride
   - Use in bleeding gums, piles.
5. Vasoconstrictors:
   - 1% solution of adrenaline soaked in cotton gauze and packed to stop bleeding.
   - Use- epistaxis, bleeding tooth socket

Anticoagulant

Definition: Anticoagulant drugs prevent blood coagulation (clotting) and are used to prevent or cure (recurrent) venous thromboembolism (VTE).

The aim of using anticoagulants is to prevent thrombus extension and embolic complications by reducing the rate of fibrin formation. They do not dissolve already formed clot but prevent recurrences. Heparin is utilized for rapid and short-lived action, while oral anticoagulants are suitable for maintenance therapy.

Anticoagulant drugs inhibit the development and enlargement of clots by actions on the coagulation phase. They inhibit the action of the coagulation factors (the thrombin inhibitors) or interfere with the synthesis of the coagulation factors (Vitamin K antagonists). They do not lyse clots or affect the fibrinolytic pathways.

In vitro: Heparin, Sodium citrate, Sodium oxalate – Used in blood banks to store blood or used in laboratory.

Anticoagulants can be administered parenterally or orally.

Parenteral anticoagulants

Heparin (unfractionated or 'standard' heparin) acts rapidly, but also has a short duration of action. This characteristic allows heparin infusion to be used in patients at high risk of bleeding as the anticoagulation effect ends rapidly upon stopping infusion.

Low molecular weight heparins are as effective as unfractionated heparin, but have a lower risk of causing heparin-induced thrombocytopenia. They are also more convenient to use due to their longer duration of action than unfractionated heparin, and are therefore the preferred option for prevention of venous thromboembolism, for example in the treatment of deep-vein thrombosis (DVT), pulmonary embolism (PE), myocardial infarction (MI), unstable coronary artery disease and for the prevention of clotting in extracorporeal circulatory procedures. Example drugs are Dalteparin sodium, Enoxaparin sodium, and Tinzaparin sodium

Heparinoids, such as danaparoid sodium are mixtures of heparin derivatives termed glycosaminoglycans, such as heparan, dermatan, and chondroitin sulphates. Used to reduce the risk of surgical patients of developing DVT.

Argatroban is an anticoagulant that acts as a thrombin inhibitor. It is indicated for prophylaxis or treatment of thrombosis in patients with, or at risk of, heparin-induced thrombocytopenia (HIT).

Hirudins, such as desirudin, lepirudin and bivalirudin are derivatives of the salivary anticoagulant found in leeches. These compounds are direct thrombin inhibitors. Bivalirudin is indicated for unstable angina or non-ST-segment elevation MI in patients planned for urgent or early intervention, and as an anticoagulant for patients undergoing percutaneous coronary intervention.

Epoprostenol (prostacyclin PGI2) can be used to prevent platelet aggregation dur-

ing renal dialysis if heparins are unsuitable or contraindicated. Epoprostenol has a very short half-life so must be administered by continuous intravenous infusion. Can also be used in conjunction to oral anticoagulation to treat primary pulmonary hypertension resistant to other treatment, under specialist care.

Oral anticoagulants

Coumarins (Warfarin) and Phenindione antagonize the effect of vitamin K, but are slow in achieving full anticoagulatory effect (48-72 hours). From this group of drugs, warfarin is the drug of choice. Warfarin is used as prophylaxis of venous thromboembolism in at-risk patients.

Dabigatran, rivaroxaban and apixaban are oral anticoagulants which are alternatives to warfarin.

Note:

- Anticoagulants must be used carefully because using them incorrectly can lead to either ineffective prevention of clot formation or bleeding.
- During the use of Warfarin, drug-drug interactions and herb-drug interaction must be keenly observed.

Hypolipidaemic Drugs

Background: Lipids are carried in plasma in lipoproteins, after getting associated with several apoproteins. Plasma lipid concentrations are dependent on the concentration of lipoproteins.

Lipoproteins transport cholesterol and triglycerides (TG) in blood. There are four types of lipoproteins:

- Low density lipoproteins (LDL) - are primary carrier of cholesterol.
- High-density lipoproteins (HDL) - carries excess cholesterol from peripheral tissues to liver for excretion in bile, thus has a beneficial effect and reduces the risk of coronary heart disease(CHD)
- Very low- density lipoprotein (VLDL) - are primary carrier of TG.
- Chylomicrons (CM)

Normal plasma lipid levels (mg/dL)

- Total cholesterol : <200
- LDL cholesterol : <100
- HDL cholesterol : Men > 40
- HDL cholesterol : Women > 50
- Triglycerides : <150

Hyperlipoproteinemia: is an increase in plasma concentration of lipoproteins. It could be of primary or secondary origin. Primary are genetically determined, while secondary could be due to Diabetes mellitus, chronic renal disease, obesity, hypothyroidism, and certain drugs.

Raised plasma cholesterol is major risk factor for coronary artery disease (CAD). Hence reducing plasma cholesterol will be the target of hypolipidemics.

Definition: These are agents which lower the levels of lipids and lipoproteins in blood and are useful in **hyperlipidemia.**

Classification of Hypolipidemics:

1. HMG-CoA reductase inhibitors (Statins) - Eg. Lovastatin
2. Lipoprotein lipase activators (Fibrates) - Eg. Clofibrate
3. Bile acid sequestrants (Resins) - Eg. Cholestyramine
4. Lipolysis and triglyceride synthesis inhibitor- Eg. Nicotinic acid
5. Sterol absorption inhibitor- Eg. Ezetimbe
6. Miscellaneous- Eg. Gugulipid

Uses: Hyperlipidemia

11.8 Gastrointestinal Drugs: Antacid, Carminatives, Digestants, Antiemetics, Laxatives, Antidiarrhoeal, Hepatoprotective Drugs

Digestants

Background: The foods on which the human body lives, with the exception of small quantities of substances such as vitamins and minerals, can be classified as carbohydrates, fats and proteins. They cannot be absorbed in their natural forms through the gastrointestinal mucosa and for this reason, are useless nutrients without the preliminary process of digestion. This digestion can be accomplished with the help of enzymes which are secreted by various gastrointestinal glands and are required to promote the digestion for each type of food. Inability of the gastrointestinal glands to secrete enzymes in sufficient quantity may hamper digestion.[4]

Definition: These are substances intended to promote digestion of food.

A number of proteolytic, amylolytic and liplytic enzymes are marketed in combination formulations and are promoted for dyspeptic symptoms and as appetite stimulants or health tonics. They are occasionally beneficial only when elaboration of enzymes in gastro intestinal tract is deficient.

Example:

1. Pepsin

2. Papain- proteolytic enzyme from raw papaya
3. Pancreatin- mixture of pancreatic enzymes obtained from hog and pig pancreas
4. Diastase and Takadiastase- amylolytic enzymes obtained from fungus *Aspergillus oryzae*

Carminatives

Definition: These are drugs which promote the expulsion of gases from the gastro intestinal tract and give a feeling of warmth and comfort in the epigastrium

Example:

1. Sodium bicarbonate- It combines with HCl in the stomach to release carbon dioxide.
2. Oil peppermint
3. Tincture cardamom
4. Oil of Dil
5. Tincture of ginger

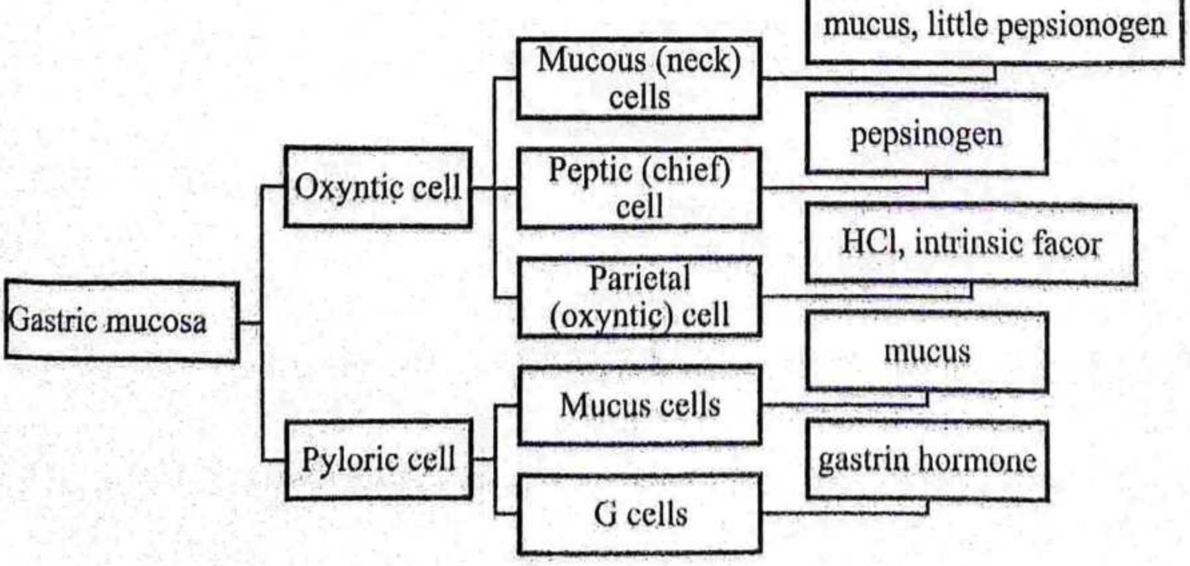
Volatile oil present in cardamom, dil, ginger, peppermint have a mild irritant action. This action increases the gastrointestinal tract motility and also relaxes the lower esophageal sphincter. It also gives a feeling of warmth and comfort in abdomen.

Antiulcer

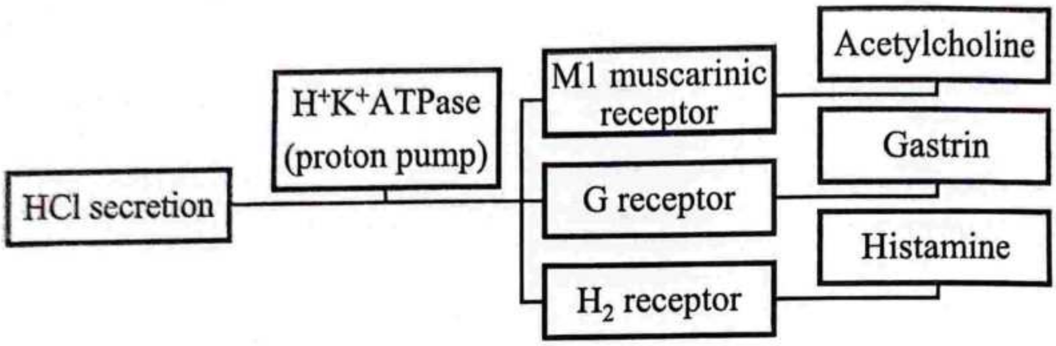
Definition: Drugs used in the treatment of peptic ulcers are called antiulcer drugs.

Background: *Physiology & regulation of gastric acid secretion:*

The gastric mucosa has two types of cells, oxyntic (gastric) and pyloric cells and each are involved in the secretion of specific enzymes or acid.



The basic neurotransmitters or hormones that directly stimulate secretion by the gastric glands are **acetylcholine, gastrin and histamine**. All these function by binding first with specific receptors for each on the secretory cells. These receptors activate the final pathway in gastric acid secretion, i.e, membrane-bound H^+/K^+ adenosine triphosphatase (ATPase) (proton pump) on parietal cells.



The **prostaglandins** act on the prostaglandin receptors on parietal cell and help in mucus secretion as well as reduce acid secretion, hence are cytoprotective in nature.

Hence targeting the receptors of acid secretion will be the aim of antiulcer therapy.

Peptic ulcer is ulceration of the mucosa in that part of the gastrointestinal tract which is exposed 'to gastric acid and pepsin, i.e, the stomach and duodenum. The etiology of peptic ulcer is not clearly known. It results probably due to an imbalance between the aggressive factors (acid, pepsin, tea, coffee, irritant foods, stress, corticosteroids, NSAIDs, *Helicobacter pylori*) and protective factors (PG secretion, bicarbonate secretion, mucous secretion) of gastric mucosa.

The goal of antiulcer therapy are:

1. Relief of pain
2. Ulcer healing
3. Prevention of complications (bleeding, perforation)
4. Prevention of relapse.

Classification:

1. Inhibitors of gastric acid secretion:
   a. Proton- pump inhibitors- Eg. Omeprazole
   b. H_2 receptor blockers- Eg. Ranitidine
   c. Antimuscarinic drugs(anticholinergic drugs)- Pirenzepine
   d. Prostaglandin analogue- Misoprostol
2. Neutralization of gastric acid(antacids)- Magnesium hydroxide
3. Ulcer protectives- Sucralfate

4. Anti-*Helicobacter pylori* (*H.pylori*) agents- Amoxicillin and others

S.N.	Type	Mechanism of action
1.	a.Proton- pump inhibitors (PPI)	PPI inhibit the membrane bound enzyme which is the final pathway in gastric acid secretion.
	b. H_2 receptor blockers	They competitively block H_2 receptor on parietal cell, therefore decrease acid secretion. More effective in inhibiting nocturnal acid secretion.
	c.Antimuscarinic drugs (anticholinergic drugs)	These agents selectively blocks M_1muscarinic receptor, hence inhibits acid secretion
	d. Prostaglandin analogue	These agents inhibit acid secretion and promoting mucus as well as bicarbonate secretion.
2.	Neutralization of gastric acid (antacids)	These agents neutralize gastric acid and raise pH of gastric contents. (see ANTACIDS for detailed explanation)
3.	Ulcer protectives	These agents form a sticky gel and adhere to ulcer, protects it and also promotes healing.
4.	Anti-*Helicobacter pylori* (*H.pylori*) agents	*H.pylori* is a gram negative bacillus adapted to survive in the hostile environment of stomach. It attaches to the surface epithelium beneath the mucus, damages cells, leading to peptic ulcer. Antimicrobials are used along with other anti-ulcer drugs.

Uses

1. Peptic ulcer disease- gastric ulcers, gastric ulcers, stress ulcers, ulcers induced by NSAIDs and *H.pylori*.
2. Dyspepsia
3. Gastroesophageal reflux disease (GERD)

Antacids

Definition: These are basic substances which neutralize gastric acid and raise pH of gastric contents.

Antacids do not decrease acid production, rather , agents that raise the antral pH to > 4, evoke reflex gastrin release, due to which more acid is secreted, especially in patients with hyperacidity and duodenal ulcer; “acid rebound” occurs and gastric motility is increased.

Classification:

1. Systemic antacid- Sodium bicarbonate- It is water soluble, acts instantaneously, but the duration of action is short. But it is absorbed systemically. It is used in casual treatment of heartburn, not given for a long time/large dose.

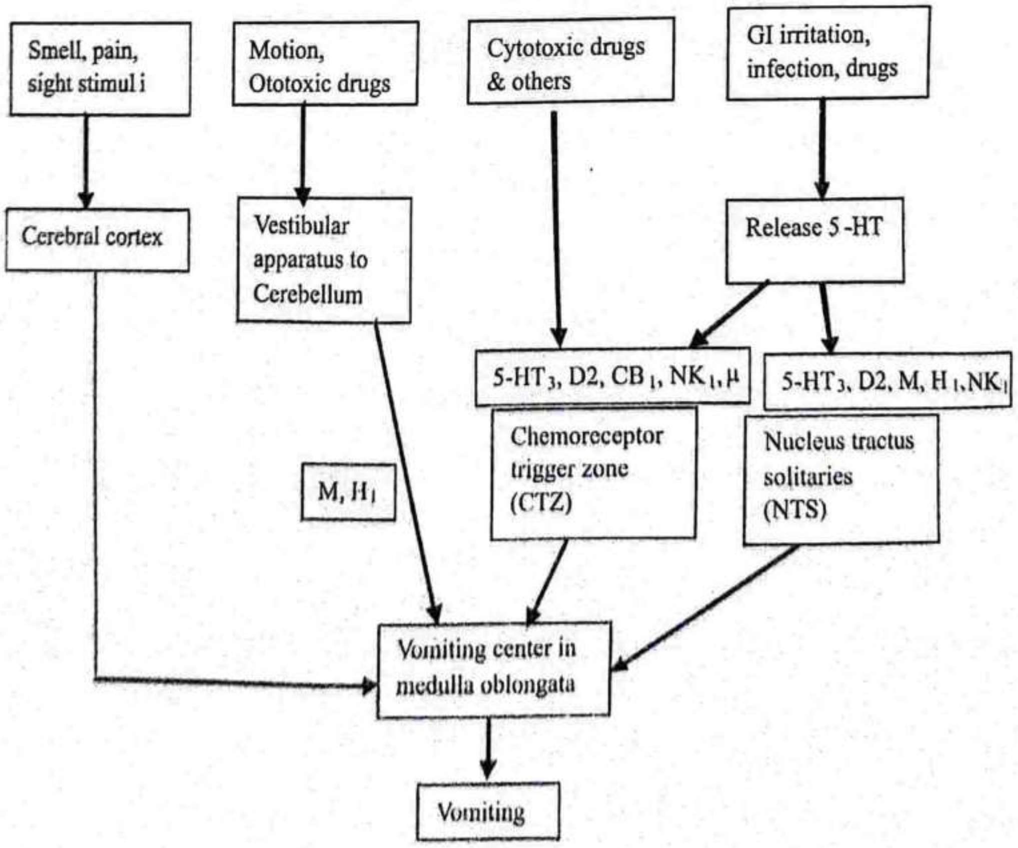
2. Non systemic antacids- These are insoluble and poorly absorbed basic compounds; react in stomach to form the corresponding chloride salt. The chloride salt again reacts with intestinal bicarbonate so that HCO3- is not spared for absorption. E.g. Magnesium hydroxide, Aluminum hydroxide gel.

Uses: Antacids are no longer used for healing peptic ulcer, because they are needed in large and frequent doses, are inconvenient, can cause acid rebound and bowel upset, afford little nocturnal protection and poor patient acceptability. Antacids are now employed only for inter-current pain relief and acidity, mostly self- prescribed, non-ulcer dyspepsia and minor episodes of hear burn.

Antiemetic

Definition: These are drugs used to prevent/suppress vomiting

Background: Vomiting occurs due to stimulation of the emetic (vomiting) centre situated in the medulla oblongata. Multiple pathways can elicit vomiting. The chemoreceptor trigger zone (CTZ) and the nucleus tractus solitaries (NTS) are the most important relay areas.



Receptors involved in physiology of vomiting – histamine H_1, dopamine D2, serotonin $5\text{-}HT_3$, cholinergic M, neurokinin NK_1, cannabinoid CB_1 and opioid . These receptors could be targets of antiemetic drug action.

Classification:

1. Anticholinergics- Eg. Hyoscine
2. H_1 antihistaminics- Eg. Promethazine
3. Neuroleptics (D2 blockers) - Eg. Chlopromazine
4. Prokinetic drugs- Eg. Metoclopramide
5. $5\text{-}HT_3$ antagonists- Eg. Ondansetron
6. NK_1 receptor antagonists- Eg. Aprepitant
7. Adjuvant antiemetics- Eg. Dexamethasone

S.N.	Type	Mechanism of action	Use
1.	Anticholinergics	Blocks afferent impulses - from vestibular apparatus to vomiting center	Effective in motion sickness
2.	H_1 antihistaminics	Blocks H_1 receptors at CTZ postoperative	Motion sickness, vomiting
3.	Neuroleptics	It acts by blocking D2 receptor in CTZ	Drug/disease induced vomiting, vomiting due to uremia.
4.	Prokinetic drugs	Hastens gastroduodenal motility and gastric emptying. It blocks D2 receptors in CTZ.	Used for prevention & treatment of nausea & vomiting induced by che motherapy, radiation, postoperative, drug in duced
5.	$5\text{-}HT_3$ antagonists	These drugs block 5-HT3 receptors in GIT, CTZ and NTS	Used for prevention & treatment of nausea & vomiting induced by che motherapy, radiation, postoperative, drug in duced and hyperemesis of pregnancy
6.	NK_1 receptor	It blocks NK1 receptors in CTZ antagonists	Chemotherapy induced nausea & vomiting
7.	Adjuvant antiemetics	-	Used as adjuvants with other antiemetics

Laxatives

Definition: These are drugs that promote evacuation of bowels.

Background: Constipation implies infrequent and incomplete evacuation of hard, dried faeces. In healthy individuals, the number of stools passed varies from 3-4 stools a day to even one stool every fourth or fifth day. The commonest habit is one evacuation in the morning hours.

Aetiology: In majority, constipation is associated with decreased peristalsis, as in habitual constipation or pregnancy. Excessive contraction of the circular muscles of the colon, commonly seen in diverticulosis or IBS does not permit onward propulsion of the faecal matter and thus produce constipation. Constipation may be due to bad habit of neglecting the urge of defecation. Certain drugs also cause constipation, like opiates, antacids and others. Also persistent use of purgatives and enemas could convert as a cause for constipation.[8]

Another term, purgative is used in this context, whose distinction may be done according to the intensity of the action. Laxative is one, with milder action and eliminates soft but formed stools (faeces), while a purgative is stronger in action and results in more fluid evacuation. Many drugs in low dose act as laxative and in larger doses as purgative.

Classification

1. Bulk forming- Eg. Dietary fibre like Bran, Ispaghula
2. Stool softener-Eg. Liquid paraffin
3. Stimulant purgative- Eg. Bisacodyl, Emodins, Tegaserol, castor oil
4. Osmotic purgative- Eg. Magnesium salts, lactulose

General mechanism of action

All purgatives increase the water content of faeces by:

1. A hydrophilic or osmotic action, retaining water and electrolytes in the intestinal lumen, thus increasing volume of the colonic contents and make it easily propelled.
2. Acting on the intestinal mucosa, decrease net absorption of water and electrolytes; intestinal transit is enhanced indirectly by the fluid bulk. Laxatives modify the fluid dynamics of the mucosal cell and may cause fluid accumulation in gut lumen by one or more of the following mechanisms:

a. Inhibiting $Na^+K^+ATPase$ of villous cells- impairing electrolyte and water absorption.

b. Stimulating adenylyl cyclase in crypt cells- increasing water and electrolyte secretion.

c. Enhancing PG synthesis in mucosa which increases secretion.

d. Increasing NO synthesis which enhances secretion and inhibits non-propulsive contractions in colon.

e. Structural injury to the absorbing intestinal mucosal cells.

3. Increasing propulsive activity as primary action, allowing less time for absorption of salt and water as a secondary effect.

S.N.	Type	Mechanism of action	Use
1.	Bulk forming (Bulk purgatives)- Dietary fibers	Dietary fibers consists of indigestible cell wall & constituents, which absorbs water in the intestines, swells, increases water content of the faeces, softens it and causes mechanical distention, thus stimulating peristalsis and promotes defecation.	Helpful in irritable bowel syndrome, symptoms like both constipation and diarrhea.
2.	Stool softener- Docusates	It is an anionic detergent, softens the stools by net water accumulation in the lumen by action on the intestinal mucosa. It emulsifies the colonic contents and increases penetration of water into the faeces.	Docusate not to be administered together with liquid paraffin.
3.	Stimulant purgative	They have direct action on GI mucosa and neurons. They inhibit Na^+K^+ATPase activity in intestinal mucosa, which increase secretion of water and electrolytes thereby stimulates peristalsis.	Long term use can lead to atonic colon. High diose can cause fluid/electrolyte imbalance. IT is contraindicated during pregnancy.
4.	Osmotic purgative	These are solutes that are not absorbed in the intestine and retain water osmotically, distend the bowel and increases peristalsis indirectly.	Practically not used for treatment of constipation. Preferred for preparation of bowel before surgery and colonoscopy, in food/drug poisoning and as after purge in treatment of tapeworm infestation.

Uses:

1. Acute function constipation - Bulk laxatives/purgatives
2. Preoperative enema - Osmotic purgatives
3. Following anthelmintic to expel worms - Osmotic purgatives
4. Constipation in children/pregnancy - Lactulose, a osmotic purgative

Contraindications

All laxatives are contraindicated in

i. A patient undiagnosed abdominal pain, colic or vomiting
ii. Secondary constipation due to stricture or obstruction in bowel, hypothyroidism, malignancies and certain drugs.

Antidiarrhoeals

Background: Diarrhea is too frequent, often too precipitate passage of poorly formed stools. It is defined by WHO as 3 or more loose or watery stools in a 24 hour period. This may be due to :

- Decreased electrolyte and water absorption
- Increased secretion by intestinal mucosa
- Increased luminal osmotic load
- Inflammation of mucosa and exudation into lumen.

Definition: Drugs used in the management of Diarrhea.

Principles of management

I. Treatment of fluid depletion, shock and acidosis (Fluid and electrolyte replacement)
II. Maintenance of nutrition
III. Drug therapy

I. Fluid & electrolyte replacement

- It is life-saving in infants, since death is usually due to dehydration.
- Oral rehydration solution (ORS)
- Simple, safe, cheap and life saving
- WHO formula of ORS -
    - NaCl: 2.6g
    - KCl: 1.5g
    - Na citrate: 2.9g
    - Glucose: 13.5g
    - Water: 1L
- Home-made ORS- 5g table salt (one pinch), 20g sugar dissolved both in 1 L of boiled and cooled water

- For severe dehydration- IV fluids

II. Maintenance of nutrition – Simple, light foods are recommended during diarrhea to prevent malnutrition.

III. Drug therapy - Drugs used in diarrheas may be categorized into

1. Specific antimicrobial drugs
2. Probiotics
3. Drugs for inflammatory bowel disease
4. Nonspecific antidiarrheal drugs

1. Specific antimicrobial drugs

Prescribed depending on the microbe, either, viral/bacterial/protozoal. Antimicrobials have a limited role in the overall treatment of diarrheal diseases as bacterial pathogen is responsible for only a fraction of cases and they may prolong the carrier state.

Diarrhea patients can be broadly placed in one of the two categories:

- Abundant watery diarrhea lacking mucus or blood, usually dehydrating with frequent vomiting but little or no fever. These are generally caused by adhesive but noninvasive enterotoxigenic bacteria such as cholera, *Salmonella* and other viruses. ORs and not antimicrobials are the main therapy.
- Slightly loose, smaller volume stools, frequently with mucus and/or blood, mild dehydration, usually attended with fever and abdominal pain but not vomiting. These are indications of mucosal invasion like *Shigella*, *E coli* and others. Antimicrobial are needed in many of these.

Antimicrobials are of no value in non-infective causes, such as irritable bowel syndrome (IBS), coeliac disease, pancreatic enzyme deficiency, tropical sprue, thyrotoxicosis. Antimicrobials are useful only in severe disease, travelers' diarrhea, *Shigella*, *Nontyphoid salmonella* enteritis.

2. Probiotics

These are microbial cell preparations, either live cultures or lyophilized powders, that are intended to restore and maintain healthy gut flora or have health benefits. Diarrheal illnesses and antibiotic use are associated with alteration in the population, composition and balance of gut microflora. Recolonization of the gut by nonpathogenic, mostly lactic acid forming bacteria and yeast is believed to help restore this balance.

3. Drugs for inflammatory bowel disease (IBD)

IBD is a chronic relapsing inflammatory disease of the ileum, colon or both, that may be associated with systemic manifestations. It is idiopathic, but appears to have an important immune component triggered by a variety of factors. The two major types of

IBD are ulcerative colitis (UC) and Crohn's disease (CrD). Drugs used in IBD are certain corticosteroids, Immunosuppressant, TNFí inhibitors, 5- Amino salicylic acid compounds.

4. Nonspecific antidiarrheal drugs

These drugs can be grouped into

a. Absorbents and adsorbents
b. Antisecretory drugs
c. Antimotility drugs

a. Absorbents and adsorbents- Absorbents are colloidal bulk forming substances like Ispaghula. Methyl cellulose which absorb water and swell. They modify the consistency and frequency of stools and give an impression of improvement, but do not reduce water and electrolyte loss. Adsorbents, like kaolin, pectin are believed to adsorb toxins in the gut and coat/protect the mucosa. These are now banned in India.

b. Antisecretory drugs- These drugs have antisecretory property, hence it corrects hypersecretion of water and electrolytes but no change in intestinal motility. It is used in symptomatic treatment of secretory diarrhea.

c. Antimotility drugs- These are opioid drugs which increase small bowel tone and segmenting activity, reduce propulsive movements and diminish intestinal secretions while enhancing absorption. The utility of antimotility drugs in diarrhea is limited to non-infective diarrhea.

Hepatoprotective

Definition: Hepatoprotective drugs act on the hepatocytes/liver directly or indirectly and help in its proper functioning.

Background: Liver plays a pivotal role in metabolism, secretion and storage and is sometimes referred as the great chemical factory of the body, because the body depends on the liver to regulate, synthesize, store and secrete many important proteins, nutrients, chemicals and to purify and clear toxins or unnecessary substances from the body. The bile secreted by the liver, among other things, play an important role in digestion. The risk of the liver intoxication has recently increased by the higher exposure to environmental toxins, pesticides and frequent use of chemotherapeutics.

Some of the liver diseases that are commonly observed are

a. Necrosis
b. Cirrhosis
c. Hepatitis- may be viral, toxic or deficiency type
d. Hepatic failure- acute or chronic

e. Liver disorders due to impaired metabolic function. Generally the disorders associated with fat (Fatty liver) and bilirubin (jaundice) metabolisms are very commonly seen.

f. Chemical/drug induced hepatotoxicity- generally may be hepatitis, jaundice and carcinogenesis.

Liver injury caused by hepatotoxins, such as CCl4, ethanol and acetaminophen, is characterized by varying degrees of hepatocyte degeneration and cell death via either apoptosis or necrosis. The generation of reactive intermediate metabolites from the metabolism of hepatotoxins and the occurrence of reactive oxygen species (ROS) during the inflammatory reaction, account for a variety of pathophysiologic pathways leading to cell death, such as disordered cytosolic calcium homeostasis, tissue glutathione (GSH) depletion, onset of mitochondrial permeability transition (MPT) and associated lipid peroxidation. The metabolism of hepatotoxins by cytochrome P-450 enzyme subtypes is a key step of the intoxication; therefore, enzyme inhibitors are shown to minimize the hepatotoxin associated liver damage. Thus, oxidative stress and lipid peroxidation are crucial elements leading to hepatotoxin- associated liver injury.

In addition to specific treatment for a given hepatotoxin, the general strategy for prevention and treatment of the damage includes reducing the production of reactive metabolites of the hepatotoxins, using anti-oxidative agents and selectively targeting therapeutics to Kupffer cells or hepatocytes for ongoing processes, which play a role in mediating a second phase of the injury.

The mechanisms include :

- Increase in antioxidant level/ decrease in oxidants.
- Inhibition of cytochrome P-450
- Increase and decrease level of liver enzymes
- Reduced peroxidation/lipid peroxidation
- Increase in level of glutathione or reducing equivalents.[9,10]

11.9 Antibacterial Drugs: Antibiotics, Antitubercular Drugs

Antibiotics

Definition: These are substances produced by microorganisms which selectively suppress the growth of or kill other microorganisms at very low concentrations. This excludes other natural substances which also inhibit microorganisms but are produced by higher forms (e.g. Antibodies) or even those produced by microbes but are needed in high concentrations (e.g. Ethanol, lactic acid)

Antitubercular Drugs

Definition: Drugs in this class differ from others in that they are designed to inhibit/ kill the infecting organism and to have no/minimal effect on the recipient. The term antimicrobial agent is used to designate synthetic as well as naturally obtained drugs that attenuate microorganisms.

Classification:

Antimicrobial drugs are classified based on :

1. Chemical structure-
   a. Sulfonamides, b. Tetracyclines
2. Mechanism of action-
   a. inhibit cell wall synthesis b. inhibit protein synthesis
3. Type of organisms against which they primarily act-
   a. Antibacterial b. antifungal
   c. antiviral d. antiprotozoal
4. Spectrum of activity-
   a. Narrow b. broad
5. Type of action-
   a. Primarily bacteriostatic b. primarily bactericidal
6. Source-
   a. fungi b. bacteria
   c. actinomycetes

Antitubercular

Background: Tuberculosis is a disease that results from infection with the bacteria *Mycobacterium tuberculosis*. It most commonly affects the lungs but can also affect other areas of the body. The infection can be active or latent, with approximately 10% of latent infections progressing to active status. The disease is spread by droplets from speaking, coughing, and sneezing. Diagnosis is via chest X-ray, microbacterial cultures, and tuberculin skin test.

TB in the lungs may cause symptoms such as a bad cough that lasts 3 weeks or longer, pain in the chest, coughing up blood or sputum (phlegm from deep inside the lungs). Other symptoms of TB disease are weakness or fatigue, weight loss, no appetite, chills, fever, sweating at night.

Definition: Antitubercular medications are a group of drugs used to treat tuberculosis.

Treatment for Tuberculosis: World Health organization recommends multidrug therapy (MDT) for all cases of TB

Objective of MDT:

- Make patients non infectious as early as possible, achieved by rapidly killing dividing bacilli with three to four bactericidal drugs.
- Prevent resistance
- Prevent relapse, by killing persisters
- Reduce total duration of effective therapy.

Anti-tubercular medications, rifampin, isoniazid, pyrazinamide, and ethambutol approved for the treatment of *Mycobacterium tuberculosis* infections. The combination and duration on which medications to use for therapy rely on whether the patient has active or latent disease.

Active Tuberculosis medicine administration

During active disease, there are two phases for treatment: the initiation phase and the continuation phase. The initiation phase consists of two months of rifampin, isoniazid, pyrazinamide, and ethambutol therapy. This regimen is administered orally daily for eight weeks for a total of 56 doses. Once completed, isoniazid, Ethambutol and rifampin are continued for an additional four-month for the continuation phase. This regimen is administered orally daily for 18 weeks for a total of 126 doses. For patients that cannot tolerate ethambutol, streptomycin can be substituted.

Latent Tuberculosis

The most typical and used treatment for latent tuberculosis is isoniazid therapy for a duration of nine months. This regimen is administered orally daily for nine months for a total of 270 doses. A three-month combination of isoniazid and rifampin or a fourth-month duration of rifampin monotherapy are also possibilities. Isoniazid monotherapy can have an effect of greater than 90% on the latent disease if taken upon completion of the full nine-month duration. Pyridoxine (vitamin B6) use is advised alongside isoniazid therapy, as isoniazid use individually can cause peripheral neuropathy secondary to vitamin B6 deficiency.

First Line	Second Line	MDR-TB [Multi-drug-resistant tuberculosis]
Rifampin (R) Isoniazid (H) Pyrazinamide (Z) Ethambutol (E)	Kanamycin Streptomycin (S) Capreomycin Amikacin Levofloxacin Moxifloxacin Gatifloxacin	Bedaquiline Delamanid Linezolid Pretomanid

Note:

- Dosages are adjusted according to weight.
- Anti-tubercular medications should be taken in the daytime one hour before consuming any meals.
- Liver function tests should be monitored routinely as rifampin, isoniazid, pyrazinamide, and ethambutol may exert hepatotoxic effects.
- A complete blood count [CBC] is also required to regularly monitor patients taking rifampin, as it can lead to thrombocytopenia and neutropenia

Treatment adherence Strategies

To treat TB disease and prevent acquired drug resistance, clinicians must ensure that their patients with TB disease follow the recommended course of treatment. However, ensuring that patients adhere to treatment can be difficult because patients are often unable or reluctant to take multiple medications for several months. Nonadherence to treatment is a major problem in TB control. Inadequate treatment can lead to

- Treatment failure
- Relapse
- Ongoing transmission
- Development of drug resistance.

Responsibility for successful treatment is assigned to the health-care provider, not the patient. Health-care professionals should consult their health department's TB control program to ensure their TB patients are able to adhere to a prescribed treatment regimen. The TB control program should assist the health-care professional in evaluating patient barriers to adherence and recommend directly observed therapy (DOT) and the use of incentives and enablers that may assist the patient in completing the recommended therapy.

Ref: Padda IS, Muralidhara Reddy K. Antitubercular Medications. [Updated 2023 Jun 3]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK557666/

- https://www.cdc.gov/tb/topic/basics/signsandsymptoms.htm

11.10 Antifungal, Antiviral, Antimalarial and Antihelmintic Drugs

Antifungal Drugs

Definition: These are drugs used for superficial and deep (Systemic) fungal infections.

Background: Infectious diseases caused by fungi are called mycoses, and are often chronic in nature, Many common mycotic infections are superficial and only involve the

skin (cutaneous mycoses), but fungi may also penetrate the skin, causing subcutaneous infections. Fungal infections are generally resistant to antibiotics used in the treatment of bacterial infections, and conversely, bacteria are resistant to the antifungal agents. Fungal infections are usually more difficult to treat than bacterial infections, because fungal organisms grow slowly and because fungal infections often occur in tissues that are poorly penetrated by antimicrobial agents. Therapy for fungal infections usually requires prolonged treatment. Potentially life threatening infections caused by dimorphic fungi are becoming more common because increasing number of immunocompromised patients is seen in clinical practice. Superficial fungal infections involve cutaneous surfaces, such as the skin, nails, hair and mucous membrane surfaces, such as oropharynx and vagina.

Classification

1. Systemic Antifungal Drugs
   a. Amphotericin B b. Flucytosine
   c. Antifungal Imidazoles- Clotrimazole, Ketoconazole
2. Topical Antifungal Drugs
   a. Nystatin b. Tolnaftate c. Miconazole

Uses

- Systemic fungal infections
- Fungal infections of scalp, skin, nails
- Candida infections like vaginal candidiasis

Antiviral Drugs

Definition: Drugs useful in the control and treatment of viral diseases are Antiviral drugs.

Background: Viruses are obligate intracellular parasites that use many of the host cell's biochemical mechanisms and products to sustain their viability. A mature virus (virion) can exist outside a host cell and still retain its infective properties. However to reproduce, the virus must enter the host cell, take over the host cell's mechanisms for nucleic acid and protein synthesis, and direct the host cell to make new viral particles.

Classification of viruses: Viruses are composed of one or more strands of a nucleic acid (core) enclosed by a protein (capsid). Many viruses possess an outer envelope of protein or lipoprotein. Viral cores can contain either DNA or RNA; thus viruses may be classified as DNA viruses or RNA viruses. Further classification is usually based on morphology, cellular site of viral multiplication, or other characteristics.

	Example	Disease caused
DNA viruses	Adenoviruses	Cold, conjunctivitis
	Hepadnaviruses	Hepatitis B
	Herpes viruses	Chickenpox, Shingles
	Pox virus	Smallpox
RNA viruses	Arboviruses	Yellow fever
	Orthomyxoviruses	Influenza
	Paramyxoviruses	Measles, mumps
	Picornaviruses	Polio, Meningitis, colds

Overview of Antiviral therapy:

Three basic approaches are used to control viral diseases:

- Vaccination
- Antiviral chemotherapy
- Stimulation of host resistance mechanisms

Vaccination has been used successfully to prevent measles, rubella, mumps, poliomyelitis, yellow fever, smallpox, chicken pox and hepatitis B. Unfortunately the usefulness of vaccines appears to be limited when many stereotypes are involved (eg. rhinoviruses, HIV). Furthermore, vaccines have little or no use once the infection has been established because they cannot prevent the spread of active infections within the host. Passive immunization with human immune globulin, equine antiserum, or antiserum from vaccinated humans can be used to assist the body's own defense mechanisms.

Chemotherapy of viral infections may involve interference with any or all of the steps in the viral replication cycle (eg. Acyclovir). As viral replication and host cell processes are so intimately linked, the main problem in the chemotherapy of viruses is finding a drug that is selectively toxic to the virus.

Examples-

1. Antiherpes virus agents - Acyclovir, Famciclovir

2. Antiinfluenza agents - Amantadine, Rimantadine

3. Other antiviral agents-

a. Immune globulin- (Ig) is a fraction obtained from the plasma of normal individuals and is rich in antibodies found in whole blood. It consists of IgG and contains trace amounts of IgA and IgM. IgG provides the patient with passive immunity and does not require time for the development of an antibody response.

b. Human Ig preparations for the treatment or prevention of Cytomegalovirus (CMV), Hepatitis B virus (HBV).

c. Interferons- The enhanced production of the cytokines called interferons is one of the body's earliest responses to a viral infection. These endogenous proteins exert potent antiviral, immunoregulatory, antiproliferative effects

Stimulation of host resistance is the least used of the antiviral intervention strategies.

Antimalarial

Definition: These are the drugs used for prophylaxis, treatment and prevention of relapses of Malaria.

Objectives and use of antimalarial drugs:

1. To prevent clinical attack (Prophylactic)
2. To treat a clinical attack of malaria (Clinical Curative)
3. To completely eradicate parasite from patient's body (Radical curative)
4. To cut down human to mosquito transmission(gametocidal)

Classification:

Antimalarial drugs exhibit considerable stage selectivity of action

1. Causal prophylactics- They act on pre-erythrocytic schizonts (in liver before invasion of RBC) - Eg. Primaquine, Proguanil
2. Blood schizontocides- They are suppressive prophylactics, destroys RBC parasites, terminates clinical attack by acting on erythrocytic schizonts- Eg. Chloroquine, Quinine, Artemisinin derivatives
3. Tissue schizonticide- They act on pre-erythrocytic as well exoerythrocytic stages in liver and thus prevent relapse.
4. Radical curatives- Eradicates all forms of organisms from the body- Eg. Schizontocides and hypnozoitocidals
5. Gametocides- They act by destroying gametes in blood and prevent transmission. Eg- Primaquine, Chloroquine

Anthelmintics

Definition: Anthelmintics are drugs that either kill (vermicide) or expel (vermifuge) infesting helminths.

Background: Helminthiasis is a broad range of organisms that include intestinal parasitic worms [roundworms (*Ascaris lumbricoides*), whipworms (*Trichuris trichiura*)

or hookworms (*Necator americanus* and *Ancylostoma duodenale*)]. Infected people excrete helminth eggs in their faeces, which then contaminate the soil in areas with inadequate sanitation. Other people can then be infected by ingesting eggs or larvae in contaminated food, or through penetration of the skin by infective larvae in the soil (hook worms). In the human body, gastro intestinal tract is the abode of many helminths, but some also live in tissues, or their larvae migrate into tissues. They harm the host by depriving him of food, causing blood loss, injury to organs, intestinal or lymphatic obstruction and by secreting toxins. Helminthiasis is rarely fatal, but is a major cause of ill health.[22]

The choice of drug for each worm infestation is based not only on efficacy, but also on lack of side effects/ toxicity, ease of administration (preferably single dose) and low cost. The current choice of drugs for worm infestations common in Indian subcontinent are

S. N	Worm	First choice drugs
1.	Roundworms (*Ascaris lumbricoides*)	Mebendazole, Albendazole, Pyrantel
2.	Hookworm (Ancylostoma duodenale)	Pyrantel, Mebendazole, Albendazole
3.	Pin worm (Enterobius vermicularis)	Pyrantel, Mebendazole, Albendazole
4.	Threadworm	Ivermectin
5.	Whipworm (*Trichuris trichiura*)	Mebendazole
6.	Tape worms	Praziquantel, Niclosamide

Uses : Helminthiasis

Amoebicidal

Definition: These are drugs useful in infection, Amoebiasis, caused by the anaerobic protozoa *Entamoeba histolytica.*

Background: *Amoebiasis:* Amoebiasis, also called as Amoebic dysentery, is a parasitic infection of the colon caused by the protozoa, *Entamoeba histolytica.* Amoebiasis infection is most common in tropical countries.

Transmission: occurs through the faecal-oral route, either directly by person – to-person or indirectly by eating or drinking faecally contaminated food or water.

Life cycle & pathogenesis: Humans are the principal host and reservoir of *E. histolytica*. Infection with *E. histolytica* is transmitted via amoebic cysts by the fecal-oral route. Ingested cysts, which are unaffected by gastric acid, undergo excystation in the alkaline small intestine and produce *trophozoites* that infect the colon. *Trophozites* either dwell in the colon, multiply, encyst, and are excreted through stools (luminal phase) and serve to continue transmission or invade the mucosa and form amoebic ulcers and cause

acute dysentery/ chronic intestinal amoebiasis. Occasionally, the trophozoites pass into the bloodstream, reach liver via portal vein and cause amoebic liver abscess. (Extra-intestinal) [19,20]

Symptoms: The clinical spectrum ranges from asymptomatic infection, diarrhea and dysentery to colitis and peritonitis as well as extra-intestinal amoebiasis.

Acute amoebiasis can present as diarrhea or dysentery with frequent, small and often bloody stools. Chronic amoebiasis can present with gastrointestinal symptoms plus fatigue, weight loss and occasional fever. Extra-intestinal amoebiasis can occur if the parasite spreads to other organs, most commonly the liver, where it causes amoebic liver abscess. Amoebic liver abscess presents with fever and right upper quadrant abdominal pain.[20]

Classification:

1. Tissue amoebicides- These agents attain high tissue concentration following administration, and is *cidal* (kills organism)in action
   a. Nitroimidazoles - Eg: Metronidazole
   b. Emetine group - Eg: Emetine
   c. For extra-intestinal amoebiasis- Eg: Chloroquine
2. Luminal amoebicides- These are poorly absorbed after oral administration. Attain high concentration in bowel. Acts on mucosal cysts and trophozoites.
   a. Amide - Eg: Diloxanide furoate
   b. Halogenated Hydroxyquinolines- Eg: Iodoquinol
   c. Antibiotics - Eg: Tetracyclines

Uses

- Amoebiasis
- Also useful in other protozoal infections

Antifilarial

Definition: These are drugs useful in the treatment of Lymphatic filariasis.

Background: Lymphatic Filariasis, commonly known as elephantiasis, is a painful and profoundly disfiguring disease.

Cause & transmission: Lymphatic filariasis is caused by infection with parasites classified as nematodes and there are 3 types of thread like filarial worms. *Wuchereria bancrofti*, which is responsible for 90% of the cases, *Brugia malayi* & *Brugia timori* which also cause the disease. Man is the definite host and mosquito is the intermediate host of filariasis. Lymphatic filariasis is transmitted by different types of mosquitoes like, *Culex* mosquito, *Anophles* and *Aedes*.

Adult worms nest in the lymphatic vessels and disrupt the normal function of the lymphatic system. The worms can live approximately 6-8 years and, during their life time, produce millions of microfilariae (immature larvae) that circulate in the blood. Mosquitoes are infected with microfilariae by ingesting blood when biting an infected host (man). Microfilariae mature into infective larvae within the mosquito. When infected mosquitoes bite people, mature parasite larvae are deposited on the skin from where they can enter the body. The larvae then migrate to the lymphatic vessels where they develop into adult worms, thus continuing a cycle of transmission.

Symptoms: Infection involves asymptomatic, acute and chronic conditions. Majority are asymptomatic, showing no external signs of infection while contributing to transmission of the parasite. Acute episodes of local inflammation involving skin, lymph nodes and lymphatic vessels often accompany chronic lymphedema (tissue swelling) or elephantiasis (skin/tissue thickening). When filariasis develops into chronic conditions it leads to lymphedema or elephantiasis of limbs and hydrocele (scrotal swelling) [19,21]

Treatment strategy

- Diethylcarbamazine- is the drug of choice for Filariasis- 2mg/kg td for 21 days.
- **Preventive chemotherapy:** Elimination of lymphatic filariasis is possible by stopping the spread of the infection through preventive chemotherapy. The WHO recommended preventive chemotherapy strategy for lymphatic filariasis elimination is mass drug administration (MDA). MDA involves administrating an annual dose of medicines to the entire at-risk population. The medicines used have a limited effect on adult parasites but effectively reduce the density of microfilariae in the bloodstream and prevent the spread of parasites to mosquitoes.

WHO recommends the following MDA regimens: [21]

- Albendazole (400mg) alone twice per year for areas co-endemic with other filarial diseases.
- Ivermectin (200mcg/kg) with Albendazole (400mg) in countries with onchocerciasis
- Diethylcarbamazine citrate (DEC) (6mg/kg) and albendazole (400mg) in countries in countries without onchocerciasis.

Recent evidence indicates that the combination of all three medicines can safely clear almost all microfilariae from the blood of infected people within a few weeks, as opposed to years using the routine two-medicine combination.

11.11 Hormones and Related Drugs: Thyroid Hormone, Thyroid Inhibitors, Insulin, Oral antidiabetic, Hormonal Contraceptives, Uterine Stimulants, Uterine Relaxants Drugs-

Antithyroid Drugs

Definition: These are drugs used to lower the functional capacity of the hyperactive thyroid gland.

A hyperactive thyroid gland leads to excessive secretion of thyroid hormones, leading to a condition called as Thyrotoxicosis. The two main causes are Grave's disease and toxic nodular goiter.

Background: The thyroid gland secretes 3 hormones- Thyroxine (T_4), triiodothyronine (T_3) and Calcitonin. The former two are produced by thyroid follicles, have similar biological activity and the term 'thyroid hormone' is restricted to these only. Calcitonin produced by interfollicular 'C' cells is chemically and biologically entirely different. It is considered along with parathormone, with which it regulates calcium metabolism.

Synthesis of Thyroid Hormones: These are synthesized and stored in the thyroid follicles as part of thyroglobulin molecule, which is a glycoprotein synthesized by thyroid cells. Synthesis involves the following steps-

1. Iodide trapping- Thyroid cells have an active transport process, Na^+: iodide symporter (NIS) to concentrate this anion; this trapping is stimulated by Thyroid stimulating hormone (TSH).
2. Oxidation & Iodination- The trapped iodide ion is oxidized to iodine by perioxidase enzyme. Iodine combines with tyrosine residues of thyroglobulin molecule to form monoiodotyrosine (MIT) and diiodotyrosine (DIT).
3. Coupling- Pairs of MIT and DIT couple together to form T_3 and T_4
4. Storage & release- T_3 and T_4 is transported to the interior of the follicle and stored as thyroid colloid. Release is controlled by TSH and involves proteolysis of iodinated thyroglobulin and exocytosis. It releases MIT, DIT, T_3 and T_4.
5. Peripheral conversion of T_4 to T_3- Most of the hormone released is T_4, which is less active. Peripheral tissues, especially liver and kidney convert T_4 to T_3.

Antithyroid drugs, thus act by inhibiting any of the steps in hormone synthesis.

Classification

1. Inhibit hormone synthesis (Antithyroid drugs)- Propylthiouracil, Methimazole, Carbimazole
2. Inhibit iodide trapping (Ionic inhibitors)- Thiocyonates(-SCN), Perchlorates (-ClOH), Nitrates

3. Inhibit hormone release – Iodine, Iodides of Sodium and potassium, Organic iodide
4. Destroy thyroid tissue- Radioactive iodine (^{131}I, ^{125}I, ^{123}I)

Compounds in group 1 and 2 may be collectively called Goitrogens, because, if given in excess, they cause enlargement of thyroid by feedback release of TSH.

Antithyroid drugs (Thioamides) - By convention, only the hormone synthesis inhibitors are called antithyroid drugs, though this term has also been applied to all thyroid inhibitors.

S.N	Type	Mechanism of action	Uses
1.	Antithyroid drugs	Bind to thyroid peroxidase and prevent oxidation of iodide/ iodotyrosyl residues, thereby; i. Inhibit iodination of tyrosine residues in thyroglobulin ii. Inhibit coupling of iodotyrosine residues to form T_3 and T_4	Thyrotoxicosis in both Graves' disease and toxic nodular goiter
2.	Ionic inhibitors	Inhibit iodide trapping by NIS into the thyroid hence T_3/T_4 cannot be synthesized.	They are toxic and not used clinically.
3.	Iodine & Iodides	Though Iodine is a constituent of thyroid hormones, it is the fastest acting thyroid inhibitor. Excess iodide inhibits its own transport into thyroid cells and interferes iodination of tyrosil resulting in reduced T_3/T_4 syntheses. However, within a few days, the gland escapes from this effect and hormone synthesis resumes.	Preoperative preparation for thyroidectomy, prophylaxis of endemic goiter
4.	Radioactive iodine	Beta rays of I destroy thyroid cells	Diagnostic scanning and therapeutically in Hyperthyroidism and thyroid carcinoma.

Antidiabetic

Background: Pancreas is a dual organ having two functions, the endocrine and exocrine. The endocrine involves production of hormones and the exocrine function involves the secretion of digestive juice-pancreatic juice. The endocrine function is performed by islets of Langerhans. Islets of Langerhans consist of four types of cells

1. α cells- release glucagon

2.β cells- release insulin

3.γ cells- release somatostatin

4. F cells - release pancreatic polypeptide (PP).

Action of Insulin: It regulates carbohydrate metabolism and blood sugar level, metabolism of proteins & fats.

Regulation of insulin secretion: Chemically, glucose, amino acids, fatty acids stimulate insulin secretion, while hypokalemia inhibits insulin secretion. The hormonal regulation involves glucagon like peptide (GLP-1). Gastrointestinal (GI) inhibitory peptide, gastrin, cholecystokinin, secretin stimulate insulin secretion. In the neural mechanism, parasympathetic increases insulin, while the g2 stimulation

Diabetes mellitus (DM) is a chronic metabolic disorder characterized by hyperglycaemia, glycosuria, hyperlipideaemia, negative nitrogen balance and sometimes ketonaemia.

There are two major types of DM:

1. Type I- Insulin dependent diabetes mellitus (IDDM): An autoimmune disorder with 90%destruction of g cells of pancreas by antibodies. Its peak incidence is in young and adolescent and hence called Juvenile diabetes.
2. Type II- Non insulin- dependent diabetes mellitus (NIDDM): The commonest form with high genetic predisposition. Over eating, obesity, underactivity, ageing are responsible for the maturity onset of this type. It involves reduced insulin sensitivity as well as impaired insulin secretion.

Prolonged hyperglycemia lead to premature atherosclerosis, retinopathy, nephropathy, gangrene of limbs.

Definition: Drugs used in the management of Diabetes mellitus.

Classification:

Oral Hypoglycaemic drugs:

These drugs lower blood glucose levels and are effective orally.

A. Enhance Insulin secretion

1. Sulfonylureas

i. 1st generation- Eg: Tolbutamide

ii. 2nd generation- Eg: Glibenclamide

2. Meglitinide/phenylalanine analogues- Eg: Repaglinide, Nateglinide

3. Glucagon-like peptide-1 (GLP-1) receptor agonists (Injectable) - Eg. Exenatide

4. Dipeptidyl peptidase-4 (DPP-4) inhibitors

B. Overcome insulin resistance

1. Biguanide (AMPK activator)- Eg: Metformin-

2. Thiazolidinediones (PPAR activator)

C. Miscellaneous antidiabetic drugs

1. α - Glucosidase inhibitors-Eg: Miglitol

2. Amylin analogue- Eg: Pramlintide

S.N	Type	Mechanism of action	Use
1.	Sulfonylureas 1st generation 2nd generation	These agents increase insulin release, increases sensitivity of peripheral tissues of insulin and also increase number of insulin receptors.	Thin NIDDM
2.	Meglitinide/pheny-lalanine analogues	These agents are K_{ATP} channel blockers, with a quick and short lasting insulin-emic action, thus release insulin.	Used with biguanides and to control postpra-ndial hyperglycemia
3.	Glucagon-like pep-tide-1 (GLP-1) receptor agonists	GLP-1 is an important incretin released from the gut in response to ingested glucose. It induces insulin release from βcells. GLP-1 agonists activate GLP-1 receptors and thus increase insulin release.	
4.	Dipeptidyl pepti-dase-4 (DPP-4) inhibitors	DPP-4 enzyme helps in rapid degrad-ation of GLP-1. Thus DPP-4 inhibitors act as indirect insulin secretagogues by inhibiting the degradation of GLP-1.	
5.	Biguanide	These agents are insulinomimetic, inhibits gluconeogenesis, decrease gastrointestinal glucose absorption and increases peripheral glucose utilization.	Obese NIDDM
6.	Thiazolidinediones	These agents stimulate synthesis of genes that increase insulin action and thus increases glucose transport to muscle and adipose tissue.	As adjuvants to sulfo-nylurea/biguanides
7.	α- Glucosidase	These agents competitively inhibit	

	inhibitors	enzyme α- glucosidase on intestinal brush border and hence prevents carbohydrate absorption.	Reduce postprandial hyperglycemia.
8.	Amylin analogue	These agents decrease glucagon secretion, slows gastric emptying	

Types of Insulin preparations

Type		Onset	Peak	Duration
Rapid acting	AspartLisproGlulisine	20-30min	1-1.5hr	3-5hr
Short acting	Regular Insulin	50-60min	2-3hr	6-8hr
Intermediate acting	Neutral protamine hagedom (NPH)	1-2hr	8-10hr	20-24hr
Long acting	GlargineDetemir	1-4hr	20-24hr	

Contraceptive Drugs

Definition: Contraceptive drugs are drugs used to prevent pregnancy or control fertility. These drugs, referred to as hormonal contraceptives, form one of the methods for birth control or contraception. Thus, hormonal contraceptives are hormonal preparations used for reversible suppression of fertility.

Background: Contraception (birth control) is defined as the intentional prevention of conception through the use of various devices, sexual practices, chemicals, drugs or surgical procedures. It prevents pregnancy by interfering with normal process of ovulation, fertilization and implantation. There are different kinds of birth control that act at different points in the process.

Classification of Contraceptive methods: Known methods of contraception, may be barrier or non-barrier method, include the following: [18]

Traditional methods-

- Coitus interruptus or withdrawal-
- Lactational Amenorrhoea method
- Calendar method or Rhythm methods
- Standard Days method (SDM)

Modern methods-

- Combined oral contraceptives (C)OCs) or the pill
- Progestogen- only pills (POPs) or the minipill
- Implants

- Progestogen only injectables
- Monthly injectable or combined injectable contraceptive (CIC)
- Combined contraceptive patch and combined contraceptive vaginal ring (CVR)
- Intrauterine device (IUD) Levonorgestrel
- Male condoms
- Female condoms
- Male sterilization (Vasectomy)
- Female sterilization (Tubal ligation)
- Emergency contraception pill (ulipristal acetate 30mg or levonorgestrel 1.5mg)

Hormonal contraceptives are one of the non-barrier method, considered the most effective contraceptive method.

Types

2. Oral
   a. Single preparations(progestin-only pill)
   i. Mini pill
   ii. Emergency(postcoital) pill
   b. Combined estrogen (E) and progestin (P) preparation:
3. Parenteral
   a. Implants- Norplant
   b. Injections
   i. Depot medroxyprogesterone acetate(DMPA)
   ii. Norethindrone enanthate (NET-EN)
   iii. Once a month medroxyprogesterone 25mg + estradiol cypionate 5mg.
4. Devices
   a. Intrauterine device(IUD)
   i. Progestasert
   ii. Levonorgestrel(LNG)
   b. Transvaginal ring
   c. Transdermal patch

Mechanism of action

- Negative feedback on hypothalamus of estrogen and progestin inhibits FSH and LH release and thus prevents ovulation.
- Estrogen suppresses FSH, hence ovarian follicle fails to develop.
- Progestin inhibits estrogen induced mid-cycle LH surge

- Progestin makes cervical mucus thick and unfavorable for sperm penetration.
- Makes endometrium unfavorable for implantation
- Causes uncoordinated contraction of cervix, uterus and fallopian tubes, hence transport of ovum, sperm, fertilization, implantation, affected

Benefits of hormonal contraception

- Avoids unwanted pregnancy
- Decreases menstrual blood loss, anemia
- Decreases dysmenorrhea, premenstrual tension
- Decreases pelvic inflammatory disease
- Decreases ovarian and endometrial carcinoma
- Decreases ovarian cyst and benign breast tumors

Adverse effects of hormonal contraception

- Current low-dose preparations have minimal side effects
- *Mild*- migraine headache, nausea, vomiting, edema, weight gain, breast tenderness, irregular cycles.
- *Severe*- Venous thromboembolism, increased risk of MI, increased blood coagulability, hypertension, increased risk of breast, cervical, endometrial cancers, cholestatic jaundice, gallstones, impaired glucose tolerance

Contraindications of hormonal contraception

- Venous thromboembolism
- Hypertension, cardiac disease
- Diabetes mellitus
- Chronic liver diseases, gall stones
- Epilepsy
- Genital tract malignancy
- Breast cancer
- Migraine
- Thyroid disease

Oxytocic

Definition: Oxytocics (Ecbolics) are uterine stimulants which stimulate uterine contractions.

Background: Oxytocin is a hormone produced by the posterior pituitary gland and contracts the uterus during the birthing process, thus helping expel the baby; also contracts myoepithelial cells in the breasts, thereby expressing milk from the breasts when the baby suckles.

Classification:

1. Posterior pituitary hormone
   Oxytocin, Desamino oxytocin
2. Ergot alkaloids
   Erogometrine, a natural alkaloid and Methylergometrine, a semisynthetic
3. Prostaglandins
   PGE_2,PGF_{2f}, 15-methyl PGF_{2f}, Misoprostol
4. Miscellaneous
   Ethacridine, Quinine

S.N	Type	Mechanism of action	Uses
1.	Posterior pituitary hormone- Oxytocin- is inactive orally	Acts on oxytocin receptors and stimulates & increases both force and frequency of contraction of pregnant uterus. Oxytocin also facilitates breast milk ejection	Induction of labor, uterine inertia, postpartum haemorrhage (PPH), breast engorgement.
2.	Ergot alkaloids	Acts by binding to 5-HT receptor, increases force, frequency and duration of uterine contraction.	PPH for prevention and treatment. After caesarean section to prevent uterine atony, hasten uterine involution
3.	Prostaglandins	Naturally synthesized by uterus and play an important role during menstruation & parturition. PGE2 and PGF2 stimulate uterine contractions and softens cervix and hastens dilatation.	PPH, for cervical ripening prior to induction of labor, also used for Induction of labor

The uterine contractions caused by Oxytocin are similar to the physiological pattern i.e. causing fundal contraction with relaxation of cervix. While uterine contractions caused by ergot alkaloids are more frequent with increasing intensity without any relaxation in between. Hence ergots are not used in induction of labor.

Uterine Relaxant

Definition: Uterine relaxants decrease the contractions of uterus and relax uterine muscles. They are also called tocolytics, [toco- refers to childbirth, and lytic- means to terminate.]

Uterine relaxants are administered where prolonged intrauterine life would greatly benefit the fetus or would permit additional time to allow treatment which promote fetal lung maturation.

Agents used in this regard include

Calcium channel blockers: Calcium is blocked from entering the smooth muscle cells, thus preventing contractions Example- Nifedipine and Verapamil commonly used

Magnesium Sulfate (MgSO4): Acts as a calcium antagonist and membrane stabilizer, thus decreasing the force of contractions. It is used prophylactically in patients with preeclampsia to prevent seizures.

Beta 2 receptor agonist: Acts on smooth muscle cells to increase levels of cAMP (via adenylate cyclase), which decreases levels of free calcium ions and reduces contractions. . Example- Ritodrine, Salbutamol &Terbutaline

Oxytocin antagonists: Oxytocin is a hormone that stimulates the uterus to contract. The drug blocks the effect of Oxytocin by binding to the Oxytocin receptor. Example – Atosiban

Prostaglandin synthesis inhibitors: They inhibit prostaglandin synthesis, hence has both beneficial and adverse effects.

Side effects: Side effects may include dizziness, flushing headaches, diplopia and flushing, anxiety.

Uses

- To stop premature labor to give time for the fetal lungs to mature
- Arrest threatened abortion
- Dysmenorrhea

Galactogogues

Definition : Galactogogues (Lactogogues) are medications or other substances believed to assist initiation, maintenance or augmentation of maternal milk production.

Background: Low milk supply is one of the most common reasons given for discontinuing breastfeeding, both mothers and physicians have sought medicine to address this concern.

Breastfeeding is a complex physiologic process involving physical and emotional factors and the interaction of multiple hormones, the most important of which is believed to be prolactin.

With parturition and expulsion of placenta, progesterone falls and a full milk supply is initiated (Lactogenesis II). Through interaction with the hypothalamus and anterior pituitary, dopamine agonists inhibit and dopamaine antagonists increase prolactin secre-

tion and thereby milk production (endocrine control). Thereafter, prolactin levels gradually decrease but milk supply is maintained or increased by local feedback mechanisms (autocrine control). Therefore an increase in prolactin levels is needed to increase but mot maintain, milk supply. If the breasts are not emptied regularly and thoroughly, milk production declines. Likewise, more frequent and thorough emptying of breasts typically results in increase milk production.

Use of galactogogues for faltering milk supply should generally be reserved for situations after both a thorough evaluation for treatable causes (eg. maternal hypothyroidism or medication) and increased frequency of breast feeding/pumping or expression has not been successful.

Indications for Galactogogues

1. Adoptive nursing- induction of lactation in a woman who was not pregnant with the current child.
2. Relactation- reestablishing milk supply after weaning
3. Increasing a faltering milk supply because of maternal or infant illness or separation.
4. Augment a declining milk supply in mothers of preterm/ill infants in NICU(Neonatal intensive care unit)

Specific Galactogogues: Usually exert their effect through antagonism of dopamine receptors, resulting in increased prolactine

1. Metoclopramide- commonly used medication for inducing/augmenting lactation.
2. Domperidone
3. Sulpiride and Chloropromazine
4. Thyrotropin- releasing hormone- not commonly used

11.12 Miscellaneous Drugs: Antiseptics and Disinfectants, Vaccines, Vitamins, Water imbalance and IV fluids

Local Antiseptics

Definition: Antiseptics are chemicals typically applied only to living tissue which are bacteriostatic in character, i.e., they only retard the growth and replication of bacteria.

Background: Antiseptics & disinfectants are extensively used in hospitals and other health care settings for a variety of topical and hard surface applications.

Biocide is a general term describing a chemical agent, usually broad spectrum that inactivates microorganism. Because biocides range in antimicrobial activity, other terms may be more specific, including 'static' referring to agents which inhibit growth and 'cidal', referring to agents which kill the target organism.

There is a difference between 'disinfection' and sterilization', where in sterilization is a process that destroys all forms of life (bacteria, fungi, viruses, spores) and refers to surgical asepsis, while disinfection is a process which reduces the number of viable pathogenic microbes to a level that they do not pose a risk to individuals with normal host defense, and refers to medical asepsis.

The terms antiseptic and disinfectant connote an agent which inhibits or kills microbes on contact. Conventionally, agents used on living surfaces(skin, mouth), like healthcare personnel hand washes, surgical scrubs and are bacteriostatic in nature are called antiseptics, while those used for inanimate objects(instruments, water supply) and are bactericidal in nature, i.e., kill a few bacteria are called disinfectants.

Antiseptics may differ markedly from disinfectants in chemical composition or may simply be a dilute version of a disinfectant for use on intact tissue. Thus some chemical substances may be used either as antiseptic or as a disinfectant, depending on concentration.

Features of an ideal antiseptic agent:

- Be destructive to all forms of microorganisms without being toxic to human cells
- Have a low incidence of hypersensitivity
- Require brief time of exposure
- Be active even in the presence of blood/pus and other organic matter
- Be stable, non-corrosive, non-staining and inexpensive

Mechanism of action

Antiseptics and disinfectants may act in three ways :

1. They may bring about a change in the structure of protein in the microbial cell (denaturation).
2. They may increase plasma membrane permeability. This results in lysis or destruction of cellular constituents.
3. They may alter a metabolic process in microbial cells which interferes with the cells ability to survive and multiply.

Classification of drugs

S. N	Group of drugs	Example	Proprietary name
1.	Phenol derivatives	Cresol	Lysol Dettol 4.8%(9% terpinol & 13% alcohol)
2.	Oxidizing agents	Potassium permanganate Hydrogen peroxide	-
3.	Halogens	IodineIodophore Chlorophores	Betadine 95% solution of Iodophores) Bleaching powder
4.	Biguanide	Chlorhexidine	-
5.	Quaternary ammonium	Cetrimide mide 20%)	Cetavlon concentrate (Cetri-
6.	Soaps	Of Sodium & potassium	-
7.	Alcohol	Ethanol	-
8.	Aldehydes	Formaldehyde	-
9.	Acids	Boric acid	-
10.	Metallic salts	Silver nitrate Zinc sulfate	-
11.	Dyes	Gentian violet	-
12.	Furan derivatives	Nitrofurazone	Furacin

Vaccines

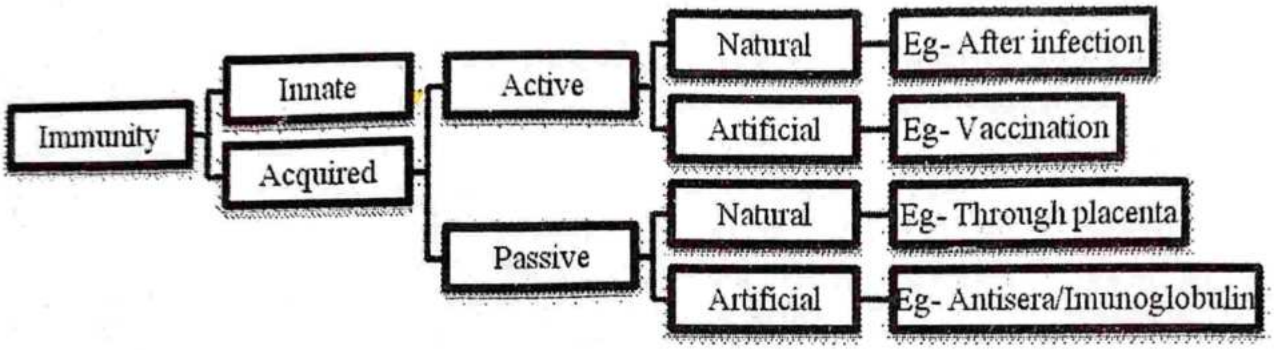
Definition: Vaccines are antigenic materials consisting of the whole microorganisms or one of its products

Background: Immunity is the ability of the body to resist almost all types of organisms or toxins that tend to damage the tissues and organs. The basic role of immune system is to discriminate the self from the non self and destroy infectious invaders attacking the body from outside and destroy the dysregulated self (cells in cancerous growth)

Immunity is said to be of the following types:

1. Innate immunity- the portion of immunity that results from general processes rather than from processes directed at specific disease organisms. Example- destruction of organisms by the acid secretions of the stomach, phagocytosis of bacteria by white blood cells (WBC)
2. Acquired immunity- The resistance that an individual acquires during life. This may be either **natural** or **artificial,** in the form of either **active** or **passive** mode. Example- immunity acquired as a result of an attack of measles infection

is an example for natural active immunity, while, immunity induced by vaccinations through live/killed microbes are examples for artificial active acquired immunity. The immunity acquired through the placenta, is an example for natural passive acquired immunity, while the resistance passively transferred by administration of antibodies is artificial passive acquired immunity.



Vaccines impart artificial active immunity, act as antigens which induce production of specific antibodies by the recipient himself.

Active Immunization

- Vaccines
- More efficacious and longer lasting
- Needs latent period of one to many weeks
- Prophylactic only

Passive Immunization

- Antisera
- Less efficacious & short acting
- Provides immediate protection
- Curative also

Vaccines are of 3 types:

1. Killed (Inactivated) vaccines
2. Live attenuated vaccines
3. Toxoids

1. Killed (inactivated) vaccines: consist of microorganisms killed by heat or chemicals. They generally require to be given by a series of injections for primary immunization. The immunity is relatively shorter- lasting, booster doses are mostly needed at intervals of months or years.
2. Live attenuated vaccines: consist of live bacteria or viruses which have rendered avirulent. They nevertheless grow and multiply in the body of the host to a limited extent. Live vaccines usually produce long-lasting immunity. In individual with impaired host defense, e.g., Leukemia or other malignancies, SLE, AIDS, the limited virulence of organisms in the live vaccine may be sufficient to cause a disease, hence live vaccines are contraindicated in them.
3. Toxoids: are modified bacterial exotoxins so that toxicity is lost but antigenicity is retained.

The term vaccine is sometimes restricted to preparations of whole microorganism and toxoids are enumerated separately.

Some examples of :

1. Bacterial vaccines:
   - Typhoid- Ty21a oral vaccine
   - Whooping cough (pertussis) vaccine
   - Bacillus Calmette- Guerin (BCG) vaccine
2. Viral vaccines:
   - Poliomyelitis- OPV
   - Rabies- Antirabic vaccine
   - Mumps virus vaccine live attenuated
   - Rubella vaccine
   - Measles- Mumps- Rubella (MMR) vaccine
3. Toxoids:
   - Tetanus toxoid
   - Diphtheria toxoid adsorbed
4. Mixed Antigens:
   - Double antigen (DT-DA)- Tetanus & Diphtheria
   - Triple antigen (DPT)- Diphtheria, Pertussis, Tetanus
   - Pentavalent vaccine- Tetanus, Diphtheria, Pertussis, Hepatitis B, Haemophilus influenza type B

Anti-Snake Venom (ASV) serum polyvalent

Definition: Anti-snake venom is a medication made up of antibodies used to treat venomous snake bites.

Background: Snakebite is an injury caused by a bite from a snake. It can be dangerous and life threatening if the snake is venomous. The six most poisonous snakes in India are; Indian Cobra, Indian Krait, Russell's viper, The King Cobra, Indian Pit Viper, Saw-scaled Viper.

The risk of snakebite envenoming is a public health hazard that many people in rural tropics face on a daily basis. In these areas, snake bite envenoming is a common cause of occupational injury affecting agricultural workers and hunters with important socioeconomic implications.

Bites by venomous snakes can cause severe paralysis that may prevent breathing; bleeding disorders that can lead to fatal haemorrhage; irreversible kidney failure; and

severe local tissue destruction that may cause permanent disability and may result in limb amputation.

Snake antivenom immunoglobulins (antivenoms) are the only specific treatment for envenoming by snake bites. Antivenoms can prevent or reverse most of the snake bite envenoming effects, and play a crucial role in minimizing mortality and morbidity. These preparations are included in the WHO list of Essential Medicines and should be part of any primary health care package where snakebites occur.[24,25]

ASV is available as purified, enzyme refined and concentrated equine globulins in lyophilized vials with 10ml ampule of distilled water. After reconstitution, each ml neutralizes not less than the following quantities of standard venoms;

0.6mg of standard Cobra (*Naga naja*) venom

0.6mg of standard Russel's viper (*Vipera russelli*) venom

0.45mg of standard Saw-scaled viper (*Echis carinatus*) venom

0.45 mg of standard Krait (*Bungarus caeruleus*) venom.

Posology & administration

Initial dose should depend upon an estimate of the amount of envenomation as mentioned below:

Envenomation		Dose
Minimal	Progressive local swelling, but no systemic symptoms.	5 vials (50ml) are usually sufficient
Moderate	Swelling beyond the site of the bite, mild systemic symptoms, and/or hematologic and neurological abnormalities	5 to 10 vials(50-100ml)
Severe	Rapidly progressive and extensive local effects, systemic symptoms and evidence of hemolysis or neurological abnormalities	10-20 vials(100-200ml) or more should be administrated

In children and small adults (body weight less than 40kg) up to 50% greater doses of anti-snake venom serum should be administered to neutralize the relatively higher venom concentration. Anti-snake serum is administrated intravenously either undiluted at the rate of 1 ml. per minute or is diluted in 500ml of intravenous fluid and administered as rapidly as tolerated over 1-2 hrs. Additional infusions containing 5-10 vials (50-100ml) should be repeated hourly until progressive swelling in the bitten part ceases and systemic signs & symptoms disappear. When an adequate dose is achieved the improvement in patient's clinical signs is often dramatic.

Allergic reactions, including anaphylactic shock, to the serum are possible. When time permits, sensitivity test should be done, otherwise adrenaline may be injected sub cutaneous concurrently. An antihistaminic and a glucocorticoid may also be given prophylactically.[25,26]

Rabies Vaccine

Background: Rabies is an infectious viral disease that is almost always fatal following the onset of clinical symptoms. In up to 99% of cases, domestic dogs are responsible for rabies virus transmission to humans. Yet, rabies can affect both domestic and wild animals. It is spread through bites or scratches, usually via saliva.

Symptoms: The incubation period for rabies is typically 2-3 months but may vary from 1 week to 1 year, dependent upon factors such as location of virus entry and viral load. Initial symptoms of rabies include fever with pain and unusual or unexplained tingling, pricking or burning sensation (paresthesia) at the wound site. AS the virus spreads to the central nervous system, progressive and fatal inflammation of the brain and spinal cord develops. People with furious rabies exhibit signs of hyperactivity, excitable behavior, hydrophobia (fear of water) and sometimes aerophobia (fear of drafts or of fresh air). Death occurs after a few days due to cardio- respiratory arrest.

Preventive immunization in people: Human rabies vaccines exist for pre exposure immunization. These are recommended for people in certain high risk occupations such as laboratory workers handling live rabies and rabies related viruses, and people whose professional or personal activities may bring them into direct contact with bats, carnivores or other mammals that may be infected.

Four rabies vaccines have been produced

a) **Antirabic vaccine carbolized (Semple vaccine):** Also called 'Neural tissue vaccine' (NTV), it is a 15 % suspension of sheep brain substance containing carbolic acid fixed rabies virus. Though long considered obsolete because of proper efficacy, need for 14 days painful large volume (2-5ml) injections into the anterior abdominal wall and risk of serious allergies, it continued to be used in government hospitals till 2005.

b) **Purified chick embryo cell vaccine (PCEV):** It consists of Flury-LEP strain of rabies virus grown on chick fibroblasts and inactivated by g-propiolactone, available as 2.5 IU in 1 ml amp **(RABIPUR)**. On administration, local pain, erythema, swelling and lymph node enlargement may occur

c) **Human diploid cell vaccine (HDCV):** It is lypophilized inactivated rabies grown in human diploid cell culture. The vial containing 2.5 IU is freshly

suspended in 1 ml of diluent. On administration, a local reaction- redness & slight induration lasting 1-2 days occurs in 10% cases. Fever & arthralgia is reported in 1%. HDCV is almost 100% effective and well tolerated.

d) **Purified vera cell rabies vaccine (PVRV):** This contains wistar rabies (PM/ WI 38-1-503-3M) strain grown on vero continuous cell line.**(VERORAB 1ml; VEROVAX-R 0.5 ml)**

Antirabies Serum

Definition: Antirabies serum also called '*equine rabies immune globulin (ERIG)*' is refined, concentrated and lyophilized serum from horses hyper immunized by repeated injections of fixed rabies virus.

It is indicated promptly after suspected exposure and is given simultaneously with rabies vaccine to non-immunized individuals.

Dose- 40 IU/kg infiltrated round the wound and excess is injected intra muscularly; single dose at the initiation of antirabic therapy along with rabies vaccine.

ARS is inferior to (Human Rabies immune globulin) HRIG and used only when HRIG is not available.

Human Rabies immune globulin (HRIG)

It is used in the same manner as ARS and is superior to it with longer t.́

Dose- 20 IU/kg. on day 0 only, infiltrated round the bite; excess may be injected intra muscularly elsewhere.

Post exposure, passive protection with HRIG or ARS is needed because active immunity takes 2 or more weeks to develop.

BERIRAB-P- 300IU/2 ml & 750 IU/5ml inj

RABGLOB- 300 IU/2ml inj

Post exposure prophylaxis (PEP): Post-exposure prophylaxis is the immediate treatment of a bite victim after rabies exposure. This prevents virus entry into the central nervous system, which results in imminent death. Effective treatment soon after exposure to rabies can prevent the onset of symptoms and death.

PEP consists of:

- Extensive washing and local treatment of the wound as soon as possible after exposure.
- A course of potent and effective rabies vaccine that meets WHO standards, and
- The administration of rabies immunoglobulin (RIG), if indicated.

This is given to all non-immunized animal bite cases suspected to have exposed to virus. Thai regime (WHO since 1992, accepted by Government of India in 2006).

0.1ml of PCEV or PVRV or 0.2ml of HDCV injected intradermally at two sites (deltoid- both arms) on 0,3,7 day followed by 1 site injection on day 28(or 30) and day 90, thus totally to 8 sites.

Day	0^{th} day	3^{rd} day	7^{th} day	$28/30^{th}$ day	90^{th} day
No. of Sites	2	2	2	1	1

As rabies vaccines take 10-14 days to develop protective antibodies, concurrent administration of rabies immunoglobulin (HRIG) (See pg.no) is recommended where risk of rabies is high.

Pre-exposure prophylaxis (Primary vaccination): This is recommended for veterinary workers and animal handlers.

Three intra dermal injections of 0.1ml each of PCEV/HDCV/PVRV are given on days 0, 7 and 28. A booster dose is given every two years.

Day	0^{th} day	7^{th} day	28^{th} day
No. of Sites	3	3	3

Post exposure prophylaxis in already vaccinated: Three 0.1 ml intradermal injection each of PCEV/HDCV/PVRV are given on days 0, 3 & 7.

Vitamins

Definition: Vitamins are non-energy yielding organic compounds, essential for normal human metabolism that must be supplied in small quantities in the diet. This definition excludes the inorganic essential trace minerals and essential amino acids and fatty acids which are required in much larger quantities.

Background: [19]Vitamins are a class of organic compounds categorized as essential nutrients. They are required by the body in very small amounts. They fall in the category of micronutrients. Vitamins do not yield energy but enable the body to use other nutrients. Since the body is generally unable to synthesize them (at least in sufficient amounts) they must be provided by food. A well balanced diet supplies in most instances the vitamin needs of a healthy person.

Vitamins are traditionally divided into two groups as :

- Fat soluble (A, D, E, K) - These (except K) are stored in the body for prolonged periods are liable to cause toxicity after regular ingestion of large amounts. Some interact with specific cellular receptors analogous to hormones.
- Water soluble (B complex, C) - these are meagerly stored, the excess is

excreted with little chance of toxicity. They act as cofactors for specific enzymes of intermediary metabolism.

Each vitamin has a specific function to perform and deficiency of any particular vitamin may lead to specific deficiency diseases. The minimum intake for the maintenance of health in respect of many vitamins has been determined, but the optimum intake remains somewhat speculative. In addition, the requirement of these micronutrients may vary with age and conditions like pregnancy, lactation.

The importance of vitamins as drugs is primarily in the prevention and treatment of deficiency diseases. Vitamin deficiencies occur due to inadequate intake, malabsorption, increased tissue needs, increase excretion, certain genetic abnormalities and drug- vitamin interactions.

Vitamin	Daily requirement	Deficiency symptoms[19]	Therapeutic uses of Vitamins
A	1000µg (4000IU)	Manifestations are: • Xerosis (dryness) of eye, Bitot's spots, Keratomalacia, night blindness • Dry & rough skin • Unhealthy GI mucosa, diarrhea • Growth retardation	1. Prophylaxis of vit A deficiency during infancy, pregnancy, lactation- -3000-5000 IU/day 2. Treatment of established vit A deficiency- 50,000-100,000 IU i.m or orally for 1-3 days
E	10mg	No clear-cut vit E deficiency has been described in humans, but vit E deficiency has been implicated in certain neuromuscular diseases in children and some cases of haemolytic anaemia	1. Primary vit E deficiency does not occur clinically. Supplemental doses (10-30mg/day) may be given to patients at risk. 2. Vitamin E has been promoted for its antioxidant property.
B1	1.7mg	**Beriberi** • Dry form- neurological symptoms are prominent- polyneuritis with numbness, tingling, hyperesthesia, muscular weakness • Wet form- Cardiovascular system is primarily affected- palpitation, breathlessness, ECG changes.	1. Prophylactically (2-10mg daily) in infants, pregnant, chronic diarrhea 2. Berberi- 100mg/day i.m or i.v. till symptoms regress- then maintenance dose s orally
B2	20mg	• Occurs in association with other deficiencies. • Characteristic lesions are angular stomatitis, sore and raw tongue, lips, throat, dry scaly skin, loss of hair, anaemia	1. To prevent and treat ariboflavinosis (2-20 mg/day oral or parenteral) generally along with other B complex members.

B3	20mg	**Pellagra** • Sunburn like dermal rash on hands, legs or face which later turn black, crack and peal • Diarrhea with stomatitis, glossitis • Dementia	1. Prophylactically (20-50mg/day oral) in people at risk of developing pellagra. 2. Treatment of pellagra- 200-500mg/day in divided doses orally or parenterally.
B6	2mg	• Occurs in association with other deficiencies. • Symptoms are seborrheic dermatitis, glossitis, growth retardation, mental confusion	1. Prophylactically (2-5mg daily) in infants and in patients with deficiency of other B vitamins
C	60mg	**Scurvy** • Swollen and bleeding gums, haemorrhage, deformed teeth, brittle bones, impaired wound healing, anaemia, growth retardation	1. Prophylactic- 50-100mg/day 2. Treatment to scurvy- 0.5-1.5g/day
K	50-100µg	Bleeding tendency. Haematuria is usually first to occur, other common sites of bleeding are g.i.t, nose and under skin.	1. Dietary deficiency- 5-10mg/day oral or parenteral 2. Malabsorption syndrome- 10mg i.m./ day or orally along with bile salts
D	400 IU	**Rickets** in children and **Osteomalacia** in adults	1. Prophylaxis- 400 IU/day 2. Treatment for deficiency- 3000-4000 IU/day

Minerals

Definition: Minerals are inorganic nutrients, usually required in small amounts from less than 1 to 2500mg/day, depending on the mineral.

Background: Minerals are inorganic substances, present in all body tissues and fluids and their presence is necessary for the maintenance of certain physicochemical processes which are essential to life.

More than 50 chemical elements are found in the human body, which are required for growth, repair and regulation of vital body functions. These can be divided into three major groups:

a. Major minerals- These include calcium, phosphorus, sodium, potassium and magnesium.

b. Trace elements- These are elements required by the body in quantities of less than a few milligrams per day, e.g. iron, iodine, fluorine, zinc, copper, cobalt, chromium, manganese, molybdenum, selenium, nickel, tin, silicon and vanadium.[19]

Only a few mineral elements (e.g., calcium, phosphorus, sodium, iron, fluorine, iodine) are associated with clearly recognizable clinical situations in man. [23]

Uses of Minerals in the body

1. Certain minerals serve as electrolytes- Sodium, Potassium, Chloride control nerve impulse and conduction, help to maintain pH balance in the body.
2. Certain minerals act as cofactors- Help to either activate an enzyme or completes a chemical reaction to form active enzymes.

Water Imbalance & IV Fluids

Background: Water is important in our body, it transports in and out of cells, help regulate body temperature, helps with food digestion, it is medium for excreting waste.

Certain terms for better understanding

- *Intravascular volume*- plasma
- *Intracellular fluid*- located within cells, 2/3 total body weight, consists of 25L of fluid
- *Extracellular fluid*- interstitial and intravascular fluids, as well as CSF/ intra ocular fluids, GI secretions, constitute 1/3 of body weight, 15L of fluid.
- *Interstitial volume*- fluid between cells (lymph)
- *Isotonic fluid*- same as plasma, cells remain unchanged, water does not leave/ enter
- *Hypotonic fluid*- less solute, more water
- *Hypertonic fluid*- more solute, less water

Most abundant electrolyte in intracellular fluid is potassium and in extracellular fluid, its sodium.

Objectives of IV fluid therapy

- To maintain daily fluid requirements when oral intake is inadequate.
- Replace present fluid loses
- Restore concurrent fluid losses

Intravenous fluids (IV fluids)

Intravenous fluids are sterile solutions and have variable content of solutes. They are used for replacement of fluid, electrolytes and nutrition. There are 3 types of IV fluids depending on osmolality, i.e. isotonic, hyptonic or hypertonic.

1. *Isotonic fluids:* If osmolality is equal to extra cellular fluid.

   Eg. Normal saline- 0.9% NaCl. Used in hyponatremia.

Ringer's lactate solution- contains K, Ca and NaCl. Corrects dehydration, hyponatremia and gastrointestinal fluid losses.

2. *Hypotonic fluids:* If osmolality is less than extra cellular fluid. Used in hypernatremia and similar hyperosmolar situations.
   Eg. 0.45% Saline, 0.2% Normal saline, 2.5% dextrose
3. *Hypertonic fluids:* If osmolality is more than extra cellular fluid.
   Eg. 5% Dextrose in Normal saline

Multiple Choice Questions (MCQ):

1. Pharmacology is derived from 'Pharmacon' which is
   a. English Word b. Spanish Word c. Greek Word d. French Word
   Ans: c. Greek Word
2. Drug is derived from 'Drogue' which is
   a. Spanish Word b. French Word c. English Word d. Greek Word
   Ans: b. French Word
3. First information regarding medicinal preparations available in
   a. Vedic literature b. Chinese literature
   c. Egyptian literature d. English literature
   Ans: a. Vedic literature
4. Hippocrates was a physician belongs to
   a. England b. France c. India d. Greece
   Ans: d. Greece
5. Insulin from Pancreas is an example for
   a. Plant Source b. Mineral source
   c. Animal Source d. Synthetic source
   Ans: c. Animal Source
6. Streptomycin is an example for which source
   a. Microbiological b. Plant c. Mineral d. Animal
   Ans: a. Microbiological
7. Ointments are the dosage forms for
   a. Internal use b. External use
   c. Both internal and external use d. Inhalation
   Ans: b. External use
8. Not the example for Parenteral type of Route of Drug administration
   a. Intravenous b. Intramuscular c. Subcutaneous d. Transdermal
   Ans: d. Transdermal

9. Pharmacokinetics in this kinesis refers to
   a. Blocking b. Movement d. Stoppage d. Aggravating
   Ans: b. Movement
10. ADME included under
   a. Pharmacodynamics b. Pharmacotherapeutics
   c. Pharmacokinetics d. Pharmaceutics
   Ans: c. Pharmacokinetics
11. The rate and extent to which the active concentration of the drug is available at the desired site of action is known as
   a. Bio Mass b. Bioavailability c. Bio activity d. Biology
   Ans: b. Bioavailability
12. The 'pattern of scatter' of the specified amount of drug to various locations within the body is known as
   a. Absorption b. Distribution c. Metabolism d. Excretion
   Ans: b. Distribution
13. The movement of drug into the blood stream from its site of administration is called
   a. Absorption b. Distribution c. Metabolism d. Excretion
   Ans: a. Absorption
14. Primary site of metabolism is
   a. Kidney b. Lungs c. Intestine d. Liver
   Ans: d. Liver
15. Removal of drug and its metabolites from body is known as
   a. Absorption b. Distribution c. Metabolism d. Excretion
   Ans: d. Excretion
16. Selective enhancement of the level of activity of specialized cells is called
   a. Stimulation b. Depression c. Irritation d. Replacement
   Ans: a. Stimulation
17. Selective diminution of activity of specialized cells is called
   a. Stimulation b. Depression c. Irritation d. Replacement
   Ans: b. Depression
18. Specialized target macromolecules present on the cell surface or intracellular which binds with specific drugs and mediate pharmacologic actions
   a. Mediators b. Hormones c. Receptors d. Enzymes
   Ans: c. Receptors

19. A substance that binds to the receptor and produces a response is known as

a. Agonist b. Antagonist c. Partial agonist d. Inverse agonist

Ans: **a. Agonist**

20. A substance that binds to the receptor and prevents the action of agonist on the receptor

a. Agonist b. Antagonist c. Partial agonist d. Inverse agonist

Ans: **b. Antagonist**

21. A substance binds to receptors, but has low intrinsic activity is called

a. Agonist b. Antagonist

c. Partial agonist d. Inverse agonist

Ans: **c. Partial agonist**

22. When the action of one drug is facilitated or increased by the other is called

a. Antagonism b. Synergism c. Subtraction d. Multiplication

Ans: b. Synergism

23. Appropriate amount of a drug needed to produce a certain degree of response in a given patient is called as

a. Quantification b. Dosage form c. Dose d. Application

Ans: c. Dose

24. Any response to a medicine that is noxious and unintended and which occurs at doses normally used in man is known as

a. Adverse Drug reactions b. Anatgonism

c. Partial Antagonism d. Inadequate treatment

Ans: a. Adverse Drug Reactions

25. Unwanted but often unavoidable pharmacodynamics effects that occur at therapeutic doses is known as

a. Secondary effects b. Toxic effects

c. Idiosyncrasy d. Side effects

Ans: d. Side effects

26. An immunologically mediated reaction producing stereotype symptoms which are unrelated to the pharmacodynamics profile of the drug

a. Toxic effects b. Idiosyncrasy c. Side effects d. Hypersensitivity

Ans: d. Hypersensitivity

27. The 'science and activities' relating to the detection, assessment, understanding and prevention of adverse effects or any other drug related problems is called as

a. Pharmacotherapeutics b. Pharmacokinetics
c. Pharmacovigilance d. Pharmacokinetics

Ans: c. Pharmacovigilance

28. Important organization involved in Pharmacovigilance in India

a. NCISM b. CDSCO c. NMPB d. RAV

Ans: b. CDCSO

29. Uppsala monitoring center (UMC) is established in Sweden in the year

a. 1975 b. 1976 c. 1978 d. 2000

Ans; c. 1978

30. Agents which produce reversible loss of sensation and consciousness is known as

a. Analgesics b. Anaesthetics c. Antiinflammatory d. Antipyretic

Ans: b. Anaesthetics

31. A drug which reduces mental tension and produces calmness without inducing sleep or depressing mental faculties'

a. Tranquillizer b. Anaesthetic c. Analgesic d. Antipyretic

Ans: a. Tranquillizer

32. A drug that subdues excitement and calms the subject without inducing sleep, though drowsiness may be produced is called

a. Hypnotic b. Anaesthetic c. Sedative d. Analgesic

Ans: c. Sedative

33. Agents that induces and /or maintains sleep, similar to normal arousable sleep

a. Hypnotic b. Anaesthetic c. Sedative d. Analgesic

Ans: a. Hypnotic

34. Agents which suppress epileptic attacks are called

a. Antiepileptic b. Analgesics c. Antiinflammatory c. Anaesthetic

Ans: a. Antiepileptic

35. Those drugs which help in the reduction in symptoms of depressive disorders by altering chemical imbalances of neurotransmitters in the brain are called

a. Antiepileptics b. Analgesics c. Antidepressants c. Sedative

Ans: c. Antidepressants

36. Benzodiazepines are the examples for

a. Analgesics b. Anti anxiety c. Antipyretic d. Hepatoprotective

Ans: b. Anti anxiety

37. Agents that selectively relieves pain by acting on the CNS or on peripheral pain mechanisms, without significantly altering consciousness is called

a. Antipyretic b. Antibiotic c. Anti anxiety d. Analgesic

Ans: d. Analgesic

38. Morphine an Analgesic alkaloid is derived from

a. Cannabis b. Marking nut c. Opium d. Digitalis

Ans: c. Opium

39. Drugs which competitively block H1 receptors and antagonize actions of histamine are known as

a. Histamine b. Antihistamine c. Analgesic d. Sedative

Ans: b. Antihistamine

40. Nimesulide is an example for

a. NSAIDS b. Ant diabetic c. Hepatoprotective d. Antidiarrhoeal

Ans: a. NSAIDS

41. Dexamethasone is an example for

a. Antitussive b. Anti inflammatory

c. Anti diabetic d. Anti diarrhoeal

Ans: b. Anti inflammatory

42. Agents that reduce fever by lowering the body temperature are called

a. Analgesics b. Anti inflammatory

c. Antitubercular d. Antipyretic

Ans: d. Anti pyretic

43. Agents which relax the smooth muscles in the airway, thus widens the airways and makes breathing easier are known as

a. Antipyretic b. Bronchodilators

c. Bronchoconstrictors d. Antispasmodics

Ans: b. Bronchodilators

44. Drugs believed to increase bronchial secretion or reduce its viscosity, facilitating its removal by coughing are known as

a. Bronchodilators b. Antiinflammatory c. Expectorant d. Antipyretic

Ans: c. Expectorant

45. Drugs that suppress the cough reflex are called
    a. Expectorant b. Antitussive c. Bronchodilators d. Analgesic
    Ans: b. Antitussive
46. Drugs used to lower blood pressure in Hypertension are known as
    a. Antipyretic b. Analgesic c. Antidiabetic d. Antihypertensive
    Ans: d. Antihypertensive
47. Amlodipine is an example for
    a. Calcium Channel Blockers
    b. Angiotensin- converting enzyme inhibitors (ACEIs)
    c. β adrenergic blockers
    d. Vasodilators
    Ans: a. Calcium Channel Blockers
48. Agents that prevent, abort or terminate attacks of Angina pectoris
    a. Anti hypertensive b. Anti anginal
    c. Analgesic d. Antibiotic
    Ans: b. Anti angina
49. Thiazide is an example for
    a. Antidiuretic b. Cathartic c. Diuretics d. Anti Diabetic
    Ans: c. Diuretics
50. An agent that dissolves stones
    a. Antidiuretics b. Lithotriptic c. Analgesic d. Anti angina
    Ans: b. Lithotriptic
51. Agents which arrest bleeding and promote coagulation and are indicated in hemorrhagic states known as
    a. Coagulants b. Anti coagulants c. Antihypertensive d. Cathartic
    Ans: a. Coagulants
52. Heparin is an example for
    a. Coagulants b. Cathartic c. Anti coagulant d. Anti pyretic
    Ans: c. Anti coagulant
53. Agents which lower the levels of lipids and lipoproteins in blood are known as
    a. Anti diabetic b. NSAIDS c. Analgesic d. Antihyperlipidemics
    Ans: d. Anti hyperlipidemics
54. Substances intended to promote digestion of food
    a. Appetizer b. Constipative c. Carminative d. Digestant

Ans: d. Digestant

55. Drugs which promote the expulsion of gases from the gastro intestinal tract and give a feeling of warmth and comfort in the epigastrium are called

a. Appetizer b. Digestant c. Carminative d. Constipative

Ans: c. Carminative

56. Basic substances which neutralize gastric acid and raise pH of gastric contents are known as

a. Appetizer b. Antacids c. Digestant d. Carminative

Ans: b. Antacids

57. Ondansetron is an example for

a. Emetics b. Anti emetics c. Carminative d. Antihypertensive

Ans: b. Anti emetics

58. Drugs that promote evacuation of bowels are called

a. Emetics b. Constipative c. Laxative d. Lithotriptic

Ans: c. Laxative

59. Liquid paraffin is an example for

a. Bulk forming b. Stool softener

c. Stimulant purgative d. Osmotic purgative

Ans: b. Stool softener

60. Substances produced by microorganisms which selectively suppress the growth of or kill other microorganisms at very low concentrations

a. Analgesic b. Antibiotics c. Constipative d. Anti inflammatory

Ans: b. Antibiotics

61. Miconazole is an example for

a. Anti angina b. Antipyretic c. Antifungal d. Anti-inflammatory

Ans: c. Antifungal

62. Mebendazole is an example for

a. Anthelmintic b. Anti-inflammatory

c. Hepatoprotective d. Antihypertensive

Ans: a. Anthelmintic

63. Drugs used to lower the functional capacity of the hyperactive thyroid gland are known as

a. Cathartic b. Anti thyroid c. Antihypertensive d. Anti diabetic

Ans: b. Anti thyroid

64. Sulfonylureas are the drugs used
    a. Hypertension
    b. Cardiac disease
    c. Hyperthyroidism
    d. Diabetes

    Ans: d. Diabetes

65. Scurvy is a disease due to deficiency of
    a. Vit A
    b. Vit B
    c. Vit C
    d. Vit D

    Ans: c. Vit C

****

Mishraka Vargikarana

Contents:

Introduction to *Mishraka Vargikarana*
1. *Brahat Panchamula*
2. *Laghu Panchamula*
2. a. *Dashamula*
3. *Valli Panchamula*
4. *Kantaka Panchamula*
5. *Trina Panchamula*
6. *Panchavalkala/Panchakshri Vraksha*
7. *Triphala*
8. *Trikatu*
9. *Trimada*
10. *Chaturushana*
11. *Panchakola*
12. *Shadushana*
13. *Chaturbija*
14. *Trijataka*
15. *Chaturjataka*
16. *Panchatikta*
17. *Trikarshika*
18. *Chaturbhadraka*

Introduction to *Mishraka Vargikarana*

यान्यौषधानि मिलितानि परस्परेण संज्ञान्तरैर्ण्यवहृतानि च योगकृद्भिः ।
तेषां स्वरूपकथनाय विमिश्रकाख्यं वर्ग महागुणमुदारमुदीरयामः ॥ रा. नि. मिश्रकादि वर्ग/1

A *Vaidya* who prepares medicines by mixing drug gives a separate name for the combination for easy identification and also to indicate their similarities. Such a group is called as *Varga. Raja nighantukara* mentions one chapter in the name of *Mishrakadi Varga.* Almost all *Nighantus* mentioned one chapter, dedicated to *Mishraka Vargikarana.*

अत्रौषधीनां मिश्रीकृत्य गणरूपतयाऽभिधानादस्य मिश्रक संज्ञा । (चक्रपाणि)

Again, the combination of many *Aushadha dravyas* having similar morphology and pharmacological actions is called a *Gana* and *Mishraka* is synonym of *Gana.*

The first reference of *Gana* or *Mishraka* goes back to *Sushruta Samhita,* where for the first time *Sushruta* has given the name *'Gana'* for 37 groups which is mentioned in 38th chapter called *Dravya Sangrahaniyamadhyayam,* like *Brahat panchamula, Laghupanchamula, Valli panchamula, Kantaka panchamula, Tranapancamūla* and *Triphala.*

Advantages with Mishraka Vargikarana is it is very easy to remember the drugs included, easy to prepare medicines and to prescribe.

In modern pharmacology as such there are no direct references regarding the combination, but there also one of the criteria's being similar pharmacological actions.

1. *Brahat Panchamula*

बिल्वाग्निमन्थटिण्टुक पाटलाः काश्मरी चेति महत् ॥ सतिक्तं कफवातघ्नं पाके लघ्वग्निदीपनम् । मधुरानुरसं चैव पञ्चमूलं महत् स्मृतम् ॥ सु. सू. 38/68-69

बिल्व काश्मर्य तर्कारी पाटलाटिण्टुकैर्महत् । जयेत्कषायतिक्तोष्णं पञ्चमूलं कफानिलौ ॥

अ.हृ.सू. 6/167-168

श्रीफलः सर्वतोभद्रा पाटला गणकारिका । श्योनाकः पञ्चभिश्चैतेः पञ्चमूलं महन्मतम् । पञ्चमूलं महत्तिक्तं कषायं कफवातनुत् । मधुर श्वासकासघ्नमुष्णं लघ्वग्निदीपनम् ॥

भा.प्र. गुडूच्यादिवर्ग 30-31

This is also called as *'Mahat Panchamula'*

Sl. No.	*Dravya Nāma*	Botanical Name
1.	*Bilva*	*Aegle marmelos*
2.	*Agnimantha*	*Premna integrifolia*
3.	*Tintuka*	*Oroxylum indicum*
4.	*Patala*	*Streospermum suaveolens*
5.	*Kashmari*	*Gmelina arboroea*

Guna Karma

Rasa -Tikta Kashaya *Guna - Laghu*

Doshakarma - Kaphavatahara

Karma - Swasahara, Kasahara & Dipaka

2. *Laghu Panchamula*

तत्र त्रिकण्टकबृहतीद्वय पृथक्पर्ण्यो विदारिगन्धा चेति कनीयः ।

कषायतिक्तमधुरं कनीयः पञ्चमूलकम् । वातघ्नं पित्तशमनं बृंहणं बलवर्धनम् ॥

सु.सू. 38/66-67

ह्रस्वं बृहत्यंशुमतीद्वयंगोक्षुरकैः स्मृतम् । स्वादुपाकरसं नातिशीतोष्णं सर्वदोषजित् ॥

अ.हृ.सू. 6/168-169

शालपर्णी पृश्निपर्णी वार्ताकी कण्टकारिका । गोक्षुरः पञ्चभिश्चैतेः कनिष्ठं पञ्चमूलकम् ॥ पञ्चमूलं लघु स्वादु बल्यं पित्तानिलापहम् । नात्युष्णं बृंहणं ग्राहि ज्वरश्वासाश्मरी प्रणुत् ॥

भा.प्र. गुडूच्यादिवर्ग 47-48

This is also known as *Kaniya* or *Kanishtha Panchamula*

Sl. No.	*Dravya Nama*	Botanical Name
1.	*Gokshura*	*Tribulus terrestris*
2.	*Brahati*	*Solanum indicum*
3.	*Kantakari*	*Solanum xanthocarpum*
4.	*Prishniparni*	*Uraria picta*
5.	*Shalaparni*	*Desomodium gangeticum*

Guna Karma

Rasa -Tikta Kashaya Madhura

Guna - Laghu,

Doshakarma - Vata pittahara

*Karma - Brahmana, Balya, Grahi, Ashmarib*hedana

2. a. *Dashamula*

अनयोर्दशमूलमुच्यते । गणःश्वासहरो ह्लेष कफपित्तानिलापहः ॥

आमस्य पाचनश्चैव सर्वज्वरविनाशनः ॥ सु.सू. 38/70-71

पाटलाग्निमन्थश्योनाकबिल्वकाश्मर्यकण्टकारिका बृहतीशालपर्णीप्रश्निपर्णी गोक्षुरका इति दशेमनि श्वयथुहराणि भवन्ति । च.सू. 4/16

उभाभ्यां पञ्चमूलाभ्यां दशमूलमुदाहृतम् । दशमूलं त्रिदोषघ्नं श्वासकासशिरोरुजः । तन्द्राशोथज्वरानाह पार्श्वपीडारुचिर्हरेत् ॥ भा.प्र.गुडूच्यादि वर्ग-49

पञ्चमूलकयोरेतद्द्वयञ्च मिलितं यदा । तदाभिषम्भिराख्यातं गुणाढ्यं दशमूलकम् ॥

रा.नि. मिश्रक.28

Combination of *Brahat panchamula* and *Laghu panchamula* is known as *Dashamula.*

Sl. No.	*Dravya Nama*	Botanical Name
1.	*Patala*	*Stereospermum suaveolens*
2.	*Agnimantha*	*Premna integrifolia*
3.	*Shyonaka*	*Oroxylum indicum*
4.	*Bilva*	*Aegle marmelos*
5.	*Kashmarya*	*Gmelina arboroea*
6.	*Kantakari*	*Solanum xanthocarpum*

7.	*Brahati*	*Solanum indicum*
8.	*Shalaparni*	*Desmodium gangeticum*
9.	*Prashniparni*	*Uraria picta*
10.	*Gokshuraka*	*Tribulus terrestris*

Guna Karma

Doshakarma - *Tridoshahara*

Karma - *Shwasahara, Kasahara, Rujahara, Jwarahara*

Indications - *Shwasa, Kasa, Shiroruja, Tandra, Shotha, Jwara, Anaha and Parshwapida*

3. *Valli Panchamula*

विदारी सारिवा रजनीगुडूच्योऽजश्रृङ्गी चेति वल्लीसंज्ञः ॥

रक्तपित्तहरौ ह्येतौ शोफत्रयविनाशनौ । सर्वमेहहरौ चैव शुक्रदोष विनाशनौ ॥ सु.सू. 38/72-74

विदारी विदारीकन्दः रजनी हरिद्रा, रजनी इत्यन्ये पठन्ति रञ्जनी शिरहलकः अजशृङ्गी मेढ़्गिका, कर्कटशृङ्गीत्यपरे । वल्ली संज्ञः पञ्चमूलं इति शेषः ।

Sl. No.	***Dravya Nama***	**Botanical Name**
1.	*Vidari*	*Pueraria tuberosa*
2.	*Sariva*	*Hemidesmus indicus*
3.	*Rajani*	*Curcuma longa*
4.	*Guduchi*	*Tinospora cordifolia*
5.	*Ajashrangi*	*Gymnema sylvestre*

Gunakarma: *Raktapittahara, Trividha Shothahara, Sarvameha hara* and *Shukradoshanashaka.*

4. *Kantaka Panchamula*

करमर्दत्रिकंटकसैरेयक शतावरी गृध्रनख्य इति कण्टकसंज्ञः ॥

रक्तपित्तहरौ ह्येतौ शोफत्रयविनाशनौ । सर्वमेहहरौ चैव शुक्रदोषविनाशनौ ॥ सु.सू. 38/73-74

The group of plants having spines and useful part is Root.

Sl. No.	***Dravya Nama***	**Botanical Name**
1.	*Karamarda*	*Carissa carandas*
2.	*Gokshura*	*Tribulus terrestris*

3.	*Saireyaka*	*Barleria prionitis*
4.	*Shatavari*	*Asparagus racemosus*
5.	*Gridhranakha*	*Capparis zeylanica*

Guna Karma: *Raktapittahara, Trividha Shophahara, Sarvamehahara & Shukradoshanashaka*

5. *Trana Panchamula*

कुशकाशनलदर्भकाण्डेक्षुका इति तृणसंज्ञकः । मूत्रदोषविकारं च रक्तपित्तं तथैव च ।

अन्त्यः प्रयुक्तः क्षीरेण शीघ्रमेव विनाशयेत् ॥ सु.सू. 38/75-76

तृणाख्यं पित्तजिदर्भकासेक्षुशरशालिभिः ॥ अ.हृ.सू. 6/71

दर्भादिपञ्चकं तृणपञ्चमूलसंज्ञं पित्तजिच्च । दर्भः-कुशः । काशः-काशेक्षुः । इक्षुः-गुडदण्डः । शरो-मुञ्जः । शालयः-स्वनाम प्रसिद्धाः । हेमाद्रि भाष्य on अ.हृ.सू. 6/171

Sl. No.	*Dravya*	Botanical Name
1.	*Kusha*	*Desmostachya bipinnata*
2.	*Kasha*	*Saccharum spontaneum*
3.	*Nala*	*Phragmites kirka*
4.	*Darbha*	*Imperata cylindrica*
5.	*Kandekshu*	*Saccharum officinarum*

Karma:

Doshakarma -Pittahara

Karma -Mutradoshahara, Raktapittahara

Note - If *Kashaya* prepared from *Tranapanchamula* is used with *Kshira* then it reduces *Rakta pitta* quickly.

6. *Panchavalkala /Panchakshri Vraksha*

न्यग्रोधोदुम्बराश्वत्थपारीषप्लक्षपादपाः । पञ्चैते क्षीरिणो वृक्षस्तेषां त्वक्पञ्चवल्कलम् ॥
केचित्तु पारीषस्थाने शिरीषं वेतसं परे, वा वदन्तीति विशेषः ॥
क्षीरिवृक्षा हिमा वर्ण्या योनिरोगव्रणापहाः । रुक्षाः कषाया मेदोघ्ना विसर्पामयनाशनः ।
शोथपित्तकफास्रघ्नाः स्तन्या भग्नास्थियोजकः । त्वक्पञ्चकं हिमं ग्राहि व्रणशोथविसर्पजित् ॥
भा.प्र. वटादिवर्ग/15-17

उदुम्बरो वटोऽश्वत्थो वेतसः प्लक्ष एव च । पञ्चैते क्षीरिणी वृक्षास्तेषां त्वक्पञ्चवल्कलम् ॥
च.द.

न्यग्रोधोदुम्बराश्वत्थ प्लक्षवेतसवल्कलैः । सर्वैरकत्र मिलितैः पञ्चवेतसमुच्यते ॥
रा.नि. मिश्रकादिवर्ग/25

तेषां पत्रं हिमंग्राहि कफवातास्त्रनुल्लघु । विष्टम्भाध्मानजिस्तित्त्कं कषायं लघु लेखनम् ॥
भा.प्र. वटादिवर्ग/18

Sl. No.	*Dravya*	Botanical Name
1.	*Nyagrodha*	*Ficus benghalensis*
2.	*Udumbara*	*Ficus glomerata*
3.	*Ashwattha*	*Ficus religiosa*
4.	*Parisha*	*Thespesia populnea*
5.	*Plaksha*	*Ficus lacor*

Chakradatta mentioned *Vetasa* (*Salix caprea*) in place of *Parisha*. Even *Rajanighantukara* has given same opinion.

Gunakarma:

Virya - Shita, Guna - Laghu, Rasa -Tikta kashaya.

Doshakarma - Kaphavatahara,

Karma -Grahi, Lekhana,

Indications -*Vishtambha, Adhmana, Visarpa, Bhagna, Vrana, Shotha* etc.

7. *Triphala*

हरीतक्यामलकविभीतकानीति त्रिफला ॥ त्रिफला कफपित्तघ्नी मेहकुष्ठ विनाशिनी ।
चक्षुष्या दीपनी चैव विषमज्वरविनिाशनो ॥ सु.सू. 38/56-57
पथ्याविभीत धात्रीणां फलैः स्थात्त्रिफला समैः । फलत्रिकञ्च त्रिफला सा वरा च प्रकीर्तिता ॥
त्रिफला कफपित्तघ्नी मेहकुष्ठहरा सरा । चक्षुष्या दीपनी रुच्या विषमज्वरनाशिनी ॥
भा.प्र. हरीतक्यादि वर्ग/42-43

हरीतकी चामलक विभीतकमिति त्रयम् । त्रिफला त्रिफली चैव फलत्रय फलत्रिके ॥
रा.नि. मिश्रकादिवर्ग/3

राका हरीतकी योज्या द्वौ च योज्यौ विभीतकौ ॥
चत्वार्यामलकान्येत त्रिफलैषा प्रकीर्तिता । त्रिफला शोथमेहघ्नी नाशयेद्विषमज्वरान् ।
दीपनी श्लेष्मपित्तघ्नो कुष्ठहन्ती रसायनी । सर्पिमधुभ्यां भागः सैव नेत्रामयान्जयेत् ॥
हरीतक्यास्त्रयो भागाः शिवा द्वादशभागिका । षड्भागाः स्युर्विभीतस्य त्रिफलेयं प्रकीर्तिता ।

Combination of three fruits is called as *Triphala*. All the *Acharya's* have similar opinion regarding combination of *Amalaki, Haritaki* and *Vibhitaki,* but difference of opinion persists about its ratio.

Sl. No.	*Dravya*	Botanical Name
1.	*Haritaki*	*Terminalia chebula*
2.	*Amalaki*	*Emblica officinalis*
3.	*Vibhitaki*	*Terminalia belerica*

Guna Karma:

Guna - Sara

Doshakarma - Kapha Pittaghni

Karma - Mehaghni, Kushthaghni, Dipana, Chakshushya, Rasayana.

Synonyms of *Triphala*

Phalatrika, Vara, Triphali & Phalatraya. The combination of three fruits is very useful in treating many diseases and even one who want to have *Rasayana* action can use *Triphala.* With various *Anupana* like *Madhu, Ghrata,* it may be used in various diseases. Ratio of three fruits in *Triphala* as per different *Acharyas*:

Sl. No.	Name of Book/*Acharya*	*Haritaki*	*Vibhitaki*	*Amalaki*
1.	*Sushruta*	1	1	1
2.	*Bhavaprakasha*	1	1	1
3.	*Yogaratnakara*	1	2	4
4.	*Chakradatta*	1	2	4

Guna karma:

***Doshaghnata**- Tridosha, Shamaka,* but mainly *Kapha pittaghna.*

Karma- Chakshushya, Dipana, Ruchya

Rogaghnata- Prameha, Kushtha, Vishamajwara, Netravikara and Agnimandya.

8. *Trikatu*

पिप्पलि मरिचशृङ्गवेराणीति त्रिकटुकम् । त्र्यूषणं कफमेदोघ्नं मेहकुष्ठत्वगामयान् ।
निहन्याद्दीपनं गुल्मपीनसाग्त्यल्पतामपि ॥ सु.सू. 38/58-59
विश्वोपकुल्या मरिचं त्रयं त्रिकटु कथ्यते । कटुत्रिकं तु त्रिकटु त्र्यूषणं व्योष ऊच्यते ।
त्र्यूषण दीपनं हन्ति श्वासकासत्वगामयान् ॥ गुल्ममेह कफस्थौल्यमेदः श्लीपदपीनसान् ॥
भा.प्र. हरीतक्यादि वर्ग/62-63
पिप्पली मरिचं शुण्ड्गी त्रयमेतद्विमिश्रितम् । त्रिकटु त्र्यूषण व्योषं कटुत्रिकमथोच्यते ।
दीपनं रुचिदं वातश्लेष्ममन्दाग्निशूलनुत् ॥ यो.र. पूर्वार्ध
पिप्पली मरिचं शुण्ठी त्रयमेतद्विमिश्रितम् । त्रिकटु त्र्यूषणं त्र्यूषं कटुत्रयकटुत्रिकम् ॥
रा.नि. मिश्रकादिवर्ग/2

Sl. No.	*Dravya*	Botanical Name
1.	*Pippali*	*Piper longum*
2.	*Maricha*	*Piper nigrum*
3.	*Shrangavera*	*Zingiber officinale*

Guna karma:

Rasa - *Katu*, *Virya* - *Ushna*, *Vipaka* - *Katu*
Doshakarma - *Vatakaphahara*
Karma -*Dipana, Shwasahara, Ruchida, Shuulahara*

Indications - *Agnimandya, Shwasa, Kasa, Gulma, Pinasa, Twakroga, Prameha, Sthoulya, Medoroga.*

Synonyms - *Tryushana, Katutrika* & *Vyosha*

9. *Trimada*

विडङ्गमुस्ताचित्रैश्च त्रिमदः समुदाहृतः । प.प्र. 3/150

Sl.No.	*Dravya*	Botanical Name
1.	*Vidanga*	*Embelia ribes*
2.	*Musta*	*Cyperus rotundus*
3.	*Chitraka*	*Plumbago zeylanica*

Trimada, here *'Mada'* means which cause intoxication to *Krimi* and indicated in *'Krimi' Roga.*

10. *Chaturushana*

त्र्यूषणं सकणामूलं कथितं चतुरुषणम् । व्योषस्येव गुणाः प्रोक्ता अधिकश्चतुरुषणे ॥

भा.प्र. हरीतक्यादि वर्ग/66

त्र्यूषणं ग्रन्थिकयुतं जायते चतुरुषणम् । चतुरुषणमाख्यातं गुणैस्त्र्युषणवद् बुधैः ॥
कफाग्निमान्द्य विष्टम्भारुचिपीनसकासनुत् ॥ यो.र. पूर्वार्ध

Trikatu if combined with *Pippali mula* (Root of *Piper longum*) is called *Chaturushaṇa. Kanamula* and *Granthika* are the synonyms of *Pipali mula.* The properties are similar to that of *Trikatu,* but it is more potent.

Sl. No.	*Dravya*	Botanical Name
1.	*Pippali*	*Piper longum*
2.	*Maricha*	*Piper nigrum*
3.	*Shunthi*	*Zingiber officinale*
4.	*Pippalimula*	Root of *Piper longum*

Guna karma*: *Dipana, Shwasa &Kasa hara, Kaphadoshahara

Uses - *Agnimandya, Aruchi, Pinasa, Kasa*

11. *Panchakola*

पिप्पली पिप्पलीमूलं चव्यचित्रक नागरैः । पञ्चभिः कोलमात्रं पञ्चकोलं तदुच्यते ॥
पञ्चकोलं रसे पाके कटुकं रुचिकृन्मतम् । तीक्ष्णोष्णं पाचनं श्रेष्ठं दीपनं कफवातनुत् ॥
गुल्मप्लीहोदरानाहशूलघ्नं पित्तकोपनम् ॥ भा.प्र. हरीतवयादिवर्ग/72-73

पिप्पली पिप्पलीमूलं चव्यचित्रक नागरम् । राकत्र मिश्रितैरेभिः पञ्चकोलकमुच्यते ॥
पञ्चकोलं त्रिदोषघ्नं रुच्यं दीपनपाचनम् । स्वरभेदहरं चैव शूलगुल्मार्तिनाशनम् ॥
ध.नि. मिश्रकादि वर्ग/12-13

पिप्पली पिप्पलीमूल चव्ययित्रक नागरैः । सवैरेकत्र मिलितैः पञ्चकोलकमुच्यते ॥
रा.नि. मिश्रकादि वर्गः/24

The group of five drugs where in each are taken in the quantity of *One Kola* (Appr. 6gm) is called *Panchakola,* and as they are *Ushna* they are known as *'Pancha Ushana'*.

Sl.No.	*Dravya*	Botanical Name
1.	*Pippali*	*Piper longum*
2.	*Pippali Mula*	*Piper longum (Root)*
3.	*Chavya*	*Piper chaba*
4.	*Chitraka*	*Plumbago zeylanica*
5.	*Nagara*	*Zingiber officinale*

Guna Karma:

Rasa - Katu *Guna - Tikshna, Ushna*

Vipaka - Katu *Virya -Ushna*

Doshakarma - Kapha Vatahara, Pittakopaka (Tridoshaghna - by *Dhanvantari Nighantu).*

Karma - Ruchikara, Pacana, Dipana, Swarabhedahara, Artinashaka.

Rogaghnata - Gulma, Pliha, Udara, Anaha, Shula & Swarabheda.

12. *Shadushana*

पञ्चकोलं समरिचं षडूषणमुदाहृतम् । पञ्चकोल गुण तत्तु रुक्षमुष्णं विषापहम् ॥
भा.प्र. हरीतक्यादि वर्ग /74

The group containing *Pancakola* and *Maricha* is called as *Shaduushana.* The properties of *Shadushana* is similar to *Panchakola.*

Sl.No.	*Dravya*	Botanical Name
1.	*Pippali*	*Piper longum*
2.	*Pippalimula*	*Piper longum* (Root)
3.	*Chavya*	*Piper chaba*
4.	*Chitraka*	*Plumbago zeylanica*
5.	*Nagara*	*Zingiber officinale*
6.	*Maricha*	*Piper nigrum*

Guna Karma

Rasa - Katu *Guna -Tikshna, Ruksha, Ushna*

Vipaka - Katu *Virya - Ushnavirya*

Doshakarma - Kaphavatahara

Karma - Vishapaha, Ruchikara, Pachana, Dipana.

Rogaghnata - Visharoga, Agnimandya, Gulma etc.

13. *Chaturbija*

मेथिका चन्द्रशूरश्च कालाऽजाजी यवानिका । रातच्यतुष्टयं युक्तं चतुर्बीजमिति स्मृतम् ॥
तच्चूर्णं भक्षितं नित्यं निहन्ति पवनामयम् । अजीर्णं शूलामाध्मानं पार्श्वशूलं कटिव्यथाम् ॥

भा.प्र. हरीतक्यादि वर्ग/98-99

Combination of 4 types of seeds is known as *Chaturbija.*

Sl.No.	*Dravya*	Botanical Name
1.	*Methika*	*Trigonella foenumgraecum*
2.	*Chandrashura*	*Lepidium sativum*
3.	*Kalajaji*	*Carum carvi*
4.	*Yavanika*	*Apium graveolens*

Guna Karma:

Doshakarma - Vatahara

Rogaghnata-Ajirna, Shula, Adhmana, Parshwa Shula and *Katishula.*

14. *Trijataka*

त्वगेलापत्रकैस्तुल्यैस्त्रिसुगन्धि त्रिजातकम् । तद्वयं रोचनं रूक्षं तीक्ष्णोष्णं मुखगन्धहृत् ।
लघुपित्ताग्निकृद्वर्ण्यं कफवातविषापहम् ॥ भा.प्र. कर्पूरादिवर्ग4/72-73
त्वगेलापत्रकैस्तुल्यैस्त्रिसुगन्धि त्रिजातकम् । रा.नि. मिश्रकादिवर्ग/18

राला वराङ्गपत्रैश्च त्रिसुगंधीं त्रिजातकम् । कै.नि. मिश्रकवर्ग/1

The Combination of three aromatic drugs is called *Trijataka*

Sl.No.	*Dravya*	Botanical Name
1.	*Twak*	*Cinnamomum zeylanicum*
2.	*Ela*	*Elettaria cardamomum*
3.	*Patra*	*Cinnamomum tamala*

Guna Karma:

Guna - Tikshna, Laghu, Ushna

Doshakarma - Kapha Vatahara.

Karma - Rochana, Mukha dourgandhya hara, Agni Vardhaka, Varnya, Vishapaha.

15. *Chaturjataka*

नागकेशर संयुक्तं चतुर्जातकमुच्यते । रा.नि. मिश्रकादिवर्ग/18 और भा.प्र. कर्पूरादि वर्ग/72

त्रिगन्धकं सनागाह्वं चतुर्जातं प्रकीर्तितम् ॥ कै.नि. मिश्रकवर्ग/1

Trijataka if combined with *Nagakeshara* then it is called *Chaturjataka.*

Sl.No.	*Dravya*	Botanical Name
1.	*Twak*	*Cinnamomum zeylanicum*
2.	*Ela*	*Elettaria cardamomum*
3.	*Patra*	*Cinnamomum tamala*
4.	*Nagakeshara*	*Mesua ferrea*

The properties told for *Chaturjataka* is similar to *Trijataka.*

Guna Karma

Guna - Ruksha, Tikshna, Ushna

Doshakarma - Kapha Vatahara.

Karma-Rocana, Mukha dourgandhya hara, Agnivardhaka, Varnya and Vishahara.

16. *Panchatikta*

गुडूची निम्बमूलत्वक् भिषङ्माता निदिग्धिका । पटोलपत्रमित्त्येतत् पञ्चतिक्तं प्रकीर्तितम् ॥

र.त. 2/19

Sl.No.	*Dravya*	Botanical Name
1.	*Guduchi*	*Tinospara cordifolia*
2.	*Nimbamūla Twak*	*Azadirachta indica (Root bark)*

3.	*Bhishangmata*	*Adhatoda vasica*
4.	*Nidigdhika*	*Solanum xanthocarpum*
5.	*Patola patra*	*Tricosanthes dioica (Leaf)*

As the name only indicates it is the combination of bitter drugs.

Doshakarma: Pittakaphahara

Karma: Jwarahara & Raktapittaghna

Indication: Jwara, Raktapitta.

17. *Trikarshika* & 18. *Chaturbhadraka*

नागरातिविषा मुस्ता त्रयमेतत्रिकर्षिकम् । गुडूच्या मिलितं चातुर्भद्रकमुच्यते ॥

रा.नि. मिश्रकादि वर्ग/16-17

नागरातिविषा मुस्ता त्रयमेतत्रिकर्षिकम् । गुडूची संयुतं चैव चातुर्भद्रकमुच्यते ॥
ज्वरघ्नं पाचनं प्रोक्तं त्रिदोषशमनं स्मृतम् ॥ जीर्णज्वरारोचकघ्नं कण्ठामयविनाशनम् ॥

ध.नि. मिश्रकादिवर्ग/7-8

(17) ***Trikarshika***

Sl.No.	*Dravya*	Botanical Name
1.	*Nagara*	*Zingiber officinale*
2.	*Ativisha*	*Aconitum heterophyllum*
3.	*Musta*	*Cyperus rotundus*

(18) ***Chaturbhadraka***

Sl.No.	*Dravya*	Botanical Name
1.	*Nagara*	*Zingiber officinale*
2.	*Ativisha*	*Aconitum heterophyllum*
3.	*Musta*	*Cyperus rotundus*
4.	*Guduchi*	*Tinospora cordifolia*

Guna Karma

Doshakarma - Tridoshaghni

Karma - Jwaraghna, Pachana, Arocakaghna & Kanthamaya Vinashaka.

Note: Both *Trikarshika* and *Chaturbhadra* have similar properties.

Multiple Choice questions (MCQ):

1. The drug which is not mentioned among Brahat Panchamula
   a. Bilva b. Agnimantha c. Prishniparni d. Shyonaka
   Ans: c) Prishniparni
2. Brahati is included in
   a. Brihat Panchamula b. Laghu Panchamula
   c. Trina Panchamula d. Kantaka Panchamula
   Ans: b. Laghu Panchamula
3. Guduchi is one among
   a. Valli Panchamula b. Trina Panchamula
   c. Kantaka Panchamula d. Trina Panchamula
   Ans: a. Valli Panchamula
4. Gana indicated in Mutra Vikara
   a. Brahat Panchamula b. Laghu Panchamula
   c. Kantaka Panchamula d. Trina Panchamula
   Ans: d. Trina Panchamula
5. Group composing Nyagrodha, Udumbara, Ashwattha, Parisha and Plaksha are called
   a. Laghu Panchamula b. Brahat Panchamula
   c. Pancha Valkala d. Trana Panchamula
   Ans: c. Pancha Valkala
6. Combination of Haritaki, Amalaki & Vibhitaki is called
   a. Trikatu b. Trphala c. Trijataka d. Trikarshika
   Ans: b. Triphala
7. Group containing Pippali, Maricha & Shunthi
   a. Triphala b. Trmada c. Trijataka d. Trikatu
   Ans: d. Trikatu
8. Pippali, Maricha, Shunthi and Pippali Mula in total is called
   a. Chaturjataka b. Chaturushana c. Chaturbhadra d. Trikatu
   Ans: b. Chaturushana
9. Maricha is not the member of
   a. Panchakola b. Trikatu
   c. Chaturushana d. Shadushana
   Ans: a. Panchakola

10. Combination of Pippali, Pippali mula, Chavya, Chitraka & Nagara is called
    a. Trikatu b. Chaturushana c. Panchakola d. Shadushana
    Ans: c. Panchakola
11. Shadushana is
    a. Combination of Panchakola and Maricha
    b. Combination of Panchakola and Pippali
    c. Combination of Panchakola and Shunthi
    d. Combination of Panchakola and Chavya
    Ans: a. Combination of Panchakola and Maricha
12. Combination of Vidanga, Musta and Chitraka is called
    a. Trikatu b. Triphala c. Trijataka d. Trimada
    Ans: d. Trimada
13. Not the composition of Chaturbija
    a. Methika b. Chandrashura c. Kalajaji d. Maricha
    Ans: d. Maricha
14. Combination of Twak, Ela and Patra is called
    a. Trikatu b. Trijataka c. Triphala d. Trimada
    Ans: b. Trijataka
15. Twak, Ela, Patra and Nagakeshara is called
    a. Chaturjataka b. Chaturushana
    c. Chaturbhadra d. Trikatu
    Ans: a. Chaturjataka

****

13 Chapter

Nomenclature of dravya as per Nighantu, Vedic taxonomy and Botany

Contents:

- Definition of *Dravya Namakarana*
- Modern Botanical Nomenclature
- *Dravya Namakaranasya Adhara & Paryaya Adhara*
- Utility of *Paryaya* in plant identification
- Limitations of *Paryayas* in Identification
- Vedic Taxonomy
- Classification of Plants in *Veda*
- Classification Based On Morphology in *Veda*
- Plant Taxonomy & Nomenclature

Definition of *Dravya Namakarana*

Dravya Namakarana or drug nomenclature is naming of plants. Utility of plants for medicinal purpose makes it necessary to give certain names for recognising, differentiating and calling them in particular identity.

Naming of plants in ancient India has been through a process of development, addition and modifications under various influences and circumstances. Hence the tradition of nomenclature has led to existence of many *Niruktas* and in the later period the emergence of innumerable names for drugs & synonyms.

Knowledge of nomenclature was given equal importance, as justified by the following shloka;

ओषधीर्नामरुपाभ्यां जानते ह्यजपा वने । अविपाश्चैव गोपाश्च ये चान्ये वनवासिनः ॥
न नामज्ञानमात्रेण रूपज्ञानेन वा पुनः । ओषधीनां परां प्राप्तिं कश्चिद्वेदितुमर्हति ॥

(च.सू. 1/120-121)

Knowledge regarding nomenclature *(Nama)* & morphology *(Rupa)* of plants should be obtained from people living in forests or shepherds or cowherds. But mere *Nama Jnana & Rupa Jnana* is insufficient. One should also be thorough about *Aushadhi Guna Jnana.* Thus the three, i.e. *Nama jnana, Rupa jnana* and *Guna jnana* were equally important.

The same is reiterated by *Narahari,* by saying........

आभीरगोपालपुलिन्दतापसः पन्थास्तथाऽन्येपि च वन्यापारगाः ।
परीक्ष्य तेभ्यो विविधौषधाभिधा-रसादिलक्ष्माणि ततः प्रयोजयेत् ॥ (रा.नि. 1/11)

Modern Botanical Nomenclature

Taxonomy is an important aspect of systematics, which helps in identifying, naming and classifying of species.

The modern system of naming living things began with the 18th century. Swedish naturalist Carl Linnaeus, that we owe the general adoption of present binomial system, in which the first name denotes the genus, while the second (Specific epithet) name denotes the species. The specific name is usually chosen to indicate some striking characteristic of the plant.

The modern rules governing the terminology of plant taxonomy are laid down in the International code of Botanical Nomenclature (ICBN).

Some basic rules for writing binomial

1. Names of general species are printed in italics or are underlined when written or typed.
2. All specific names may be written with small initial letters.
3. Generic name starts with capital letter.
4. A generic name may be written alone when one is referring to the entire group of species making up the genus. E.g,: Asparagus sp.
5. A specific epithet (species name) is meaningless when written alone, as it is used in conjunction with dozens of different generic name. A specific epithet is always preceded by the name or the initial letter of the genus that includes. E.g.: *Manjishta* (*Rubia cordifolia*)

Dravya Namakaranasya Adhara & Paryaya Adhara

The drugs in use are many in number and varied in character. Accurate identification of these is necessary for appropriate use in medicine. Identification of a plant is usually based on morphological description. One of the ancient methods in the identification of plants are through *'Paryaya'*.

Paryaya:

The word *Paryaya* is derived from,

परि + इन् गतौ परावनुपात्यय इन् । क्रमप्राप्तस्यानतिपातो अनुपात्ययः । (श.क.द्रु)

That which follows an order.

श.क.द्रु defines *Paryaya* as,

येन सह यत् सम्पर्क सम्बन्धस्तेन सह तत् पर्यायः । यथा समानं कुलभावञ्च दानादानत्तथैव च । तयोर्वश समानं हि पर्यायञ्च प्रचक्षते ॥ इति कुलदीपिका

Words which are related to each other are called as *Paryaya.*

In English *Paryaya* means 'Synonym', and is derived from the Latin word (Syn = alike) & (noma = name).

Thus synonym is a word/phrase that means exactly or nearly the same as another.

In earlier times, the only method for identification of plants was through synonyms. These *Paryaya* were based either on their structure, source, habitat, season, properties, actions, customs, historical importance or sensory perception.

Narahari, the author of *Raja Nighantu* puts forth a few parameters on the basis of which plants are named.

नामानि क्वचिदिह रुढ़ितः स्वभावात् । देशोक्त्या क्वचन च लांछनोपमाभ्याम् ।
वीर्येण क्वचिदितराह्वातिदेशात्- द्रव्याणामिहविभजनं सप्तधोदितानि ॥ रा.नि. मङ्गलाचरण. 13

Plants are named based on the following criteria.

(i) *Rudhi* (ii) *Swabhava* (iii) *Deshokta*

(iv) *Lanchana* (v) *Upama* (vi) *Virya*

(vii) *Itarahwaya*

(i) *Rudhi*

These names have no specific meaning but have been in traditional use since generation.

Example:

Rudhi Nama	*Vyavahrata Nama*
Tuntuka	*Shyonaka*
Pachampacha	*Darvi*
Viravraksha	*Virataru*
Kinihi	*Apamarga*
Nrapadruma	*Aragwadha*

(ii) *Swabhava*

These names are used to describe the plants special innate activity which it is very familiar.

Paryaya Swabhava	Meaning	Common name
प्लीहारी	Useful in disease -*Pliha*	*Sharapunkha*
कृमिघ्न	Useful in *Krimi*	*Vidanga*
हयमार (अश्वमार)	Kills horse	*Karavira*
कृमिज	Formed by infestation	*Agaru*
घुणवल्लभा	Easily infested	*Ativisa*
गर्भनुत्	Abortifacient	*Langali*

(iii) *Deshokta:*

Plants are named on the basis of their source or habitat.

Synonym	Meaning	Drug name
मलयज	Grows in Malaya region (Western Ghats)	*Candana*
चीनाक कर्पूर	Obtained from China	*Karpura*
मागधी	Obtained from *Magadha desha*	*Pippali*
द्राविडी	Obtained from *Dravida* (Deccan)	*Ela*
हैम	Grows in *Himalaya*	*Kiratatikta*
कम्पिल्य	Grows in *Kampilla desha* (Western U.P.)	*Kampillaka*
काश्मीर बाह्लीक	Grows in *Kashmira & Bahlika*	*Kumkuma*

(iv) *Lanchana:*

The name which describes specific morphological features of plant or used part is *Lanchana*.

Synonym	Meaning	Drug name
धवल	Outer bark is whitish	*Arjuna*
चित्रतण्डुल	Spotted seeds	*Vidanga*
वक्रपुष्प	Curved flowers	*Agastya*
शुक्लकन्दा	White tubers	*Ativisha*
खरमञ्जरी	Inflorescence with spinous bracteoles	*Apamarga*

त्रिपुट	Fruit with 3 surfaces	*Ela*
दीर्घफल	Fruits which are long	*Aragwadha*
जन्तुफल	Fruits filled with insects	*Udumbara*

(v) *Upama*

Certain plants are named on the basis of Simile i.e., comparison of the plant parts to similar looking plants or animals or things.

Synonym	Meaning	Drug name
अजमोद	Fruit smells like Goat	*Ajamoda*
लाङ्गली	Tubers shaped like plough	*Langali*
कङ्कतिका	Fruit resembles comb	*Atibala*
शृङ्गी	Tubers are horn-like	*Ativisha*
ताम्रपल्लव	Coppery young leaves	*Ashoka*
वराहकर्णी	Leaves resembles pigs' ears	*Ashwagandha*
पञ्चाङ्गुल	Leaves are palmately lobed	*Eranda*

(vi) *Virya*

Plants are named on the basis of their potency or property.

Synonym	Meaning	Drug name
शीतवल्कल	Bark has *Shita Virya*	*Udumbara*
उत्कट, ऊषण	It is *Tikshna* in nature	*Shunthi*
तीक्ष्णतण्डुल	Fruits are *Tikshna*	*Pippali*
पद्मक	It is shita	*Padmaka*
बहुवीर्य	Efficacious drug	*Shalmali*

(vii) *Itarawaya:*

Other names which do not belong to the above categories are considered as *Itarāhwaya* or miscellaneous.

Synonym	Meaning	Drug name
वीरा	A potent drug	*Marica*

वरी	Best medicine	*Shatavari*
पण्या	Drug or article of trade	*Jyotishmati*
लवण	Alleviates diseases	*Jyotishmati*
पुर	Best *Niryasa*	*Guggulu*

Utility of *Paryaya* in plant identification

Synonyms are given to almost every drug in classical texts, *Nighantus* which follow different trends, style and format based on various factors. *Paryayas* comprehensively covers the various aspects of the drugs, relating to nomenclature, identification, pharmacodynamics and therapeutics. Thus they will help in identifying and understanding the *Dravya* in total.

1. *Dhattura (Dhatura metel)*

The plant *Dhattura (Dhatura metel)* has some synonyms like,

Unmatta → Refers to its *Madaka* action
Ghantapushpa → Refers to funnel shaped flowers
Kanakahwaya → Refers to golden brown seeds
Matulaputraka → Refers to the fruit

2. *Katuki (Picrorrhiza kurroa):*

Kantakaruha → Grows by stem or rhizomes.
Matsyashakala → Rhizomes have fleshy scales.
Chakrangi → Refers to the circular ring on transverse section.
Krashnabheda → Black coloured on breaking.
Katvi → Unpalatable due to its bitter taste
Matsyapitta → Taste & smells like *Matsya pitta.*

3. *Apamarga (Achyranthes aspera):*

Kharamanjari → Refers to the spiny spike inflorescence.
Shikhari → Refers to spiny spike Inflorescence.
Adhah salya → Spinous perianth.
Vrattaphala → Refers to globose fruit.
Durgraha → Difficult to touch because of spiny inflorescence.

Thus with the help of a group of synonyms and not a single synonym, we can to some extent identify the plant.

Limitations of *Paryayas* in Identification

Compilation of *Paryaya* started with *Nirukta* and later by *Nighantu,* the author of these *Nighantus* compiled about names which were prevalent during that time and at that region. They also added and coined new terms which led to repetition.

1. We find several such examples, where a single name is used as *Paryayas* for many drugs.
   (i) *Amrata* - Refers to *Haritaki, Vibhitaki, Guduchi.*
   (ii) *Haimavati* - To *Vacha, Haritaki.*
   (iii) *Languli* - For *Kapikacchu, Jalapippali, Narikela*
   (iv) *Madhuparni* - For *Guduchi, Gambhari.*
   (v) *Krashna* - For *Pippali, Maricha, Parpati*
2. There are very few synonyms which gives clear morphological description of all plants.
3. Synonyms which refer to properties or actions fail to identify the plant.
   Due to these reasons, synonyms at many instances have led to controversy in identification.

Solution

(i) Compile *Paryayas* used in *Brahatrayi* and give more emphasis to these.
(ii) Adopt suitable modern botanical identification with taxonomy.
(iii) Therapeutic assessment to finalise.

Thus a collaborative work between the subject expert, a Sanskrit scholar, botanist and clinician will help to solve controversy caused due to *Paryayas*. The final conclusion should be made authoritative and accepted everywhere.

Vedic Taxonomy

Use of herbal medicines can be traced to one of the oldest treaties in the world is *RIG-VEDA*' (4500 BC - 1000 BC) Where healing properties of herbs are mentioned. The most celebrated plant that finds frequent mention in the *Rigveda* and later *Samhitas* is the Soma plant. The Vedic Indians hail *Soma* as the Lord of the forest (*Vanaraja*). The botanical identity of Soma plant, however, has not been decided till today. The probable candidates are *Ephedra* (a Gymnosperm); *Sarcostemma* (flowering plant); and mush-room (a fungus).

The second most mentioned plant is *Ashwattha* (*Ficus religiosa*) during the Vedic period. The *Rgveda* refers to utensils and vessels fashioned out of the wood of the *Ashwattha* tree.

Some of the other trees that find mention in the Vedas are:

(i) Silk cotton (*Salmalia malabaricum*);

(ii) *Khadira* (*Acacia catechu*)

(iii) *Simshapa* (*Dalbergia sissoo*);

(iv) *Vibhitaka* (*Terminalia bellerica*);

(v) *Sami* (*Prosopis spicegera*);

(vi) *Plaksa* (*Ficus infectoria*); and

(vii) *Iksu* (sugar cane - *Saccharum offcinarum*) finds a mention as a cultivated plant in the *Atharvaveda, Maitaryani Samhita*, and other texts.

The Vedic Indians knew about many flower-bearing and fruit-bearing plants, like *Palasha* (*Butea monosperma*), two varieties of lotus - white (*Pundarika*) and blue (*Pushkara*), white lily (*Kumuda*), cucumber (U*rvaruka*), *Jujuba* (*Zizypus jujuba*), *Udumbara* (*Ficus glomerata*), *Kharjura* (*Phoenix dactylifera*) and *Bilva* (*Aegle marmelos*), etc.

Classification of Plants in *Veda*

Plants were classified in accordance with three distinct principles,

- Botanical (*Udbhida*),
- Medicinal (*Virechanadi*) and
- Dietetic (*Annapanadi*).

The *Rigveda* divides plants roughly into three broad classes, namely,

- *Vriksha* (Tree),
- *Osadhi* (herbs useful to humans) and
- *Virudh* (creepers).

Plants are further subdivided into

- *Visakha* (Shrubs),
- *Sasa* (Herbs),
- *Vratati* (Climbers),
- *Pratanavati* (Creepers) and
- *Alasala* (Spreading on the ground).
- All grasses are separately classified as *Trina*, flowering plants are *Puspavati*, and the fruit bearing ones are *Phalavati*.
- Leafless plants are placed under the group, *Karira*.

The *Atharvaveda* has classified plants into various categories based on their morphological characters and other properties, such as

- *Prasthanavati* (Spreading),
- *Sthambini* (Bushy),
- *Ekasugna* (with single whorl of calyx),
- *Amshumati* (having many shoots),
- *Kandini* (jointed),
- *Visakha* (having extending branches),
- *Jiivala* (lively),
- *Nagharisa* (harmless) and
- *Madhumati* (very sweet).

Classification Based On Morphology in Veda

In *Yajurveda* the plants are broadly classified on the basis of Morphology of plants. In *Yajurveda* 12-89 and *Atharvaveda* 8-7-27 it is clearly stated that the Brahaspati (God) has created the various types of plants for the kingdom and they can be uses for food as well as Medicine. The types of plants or the groups of the plants mentioned in these Mantras are as fallow:

1. ***Apushpa*** **:** Non flowering / Invisible flowers
2. ***Pushpini*** : Flowering or with flowers.
3. ***Aphala*:** Fruit less / without fruits
4. ***Phalinirya*:** with fruits

So on the basis plants can be classifieds

Plants
- ***Apushapa*** (Non-flowering) (Present - cryptogames)
- ***Pusphini*** (Flowering) (Present - Phanerogames)
  - ***Aphala*** Fruitless Present - Gymnosperms
  - ***Phalinirya*** With fruits Present-Angiosperms

So in the Vedic period they knew about uses of flower, fruit and the various plants and their uses

Other references from Vedas

On colour, swarupa, guna, utpatti, size, and medicinal use the plants are classified in

Atharaveda 8-7-1, 4,6,7,10,9,17,12,13,27,20. All these clearly indicate that the ancient Indian Science knew the plants, their places, contents and uses. The plant is called as Taru means, which helps in overcoming or curing the diseases.

Some ancient scientists, like Manu, have classified the plants in to eight classes as follows:

1. ***Oshadhi*** - plants bearing abundant flowers and fruits, but withering away after fructification, e.g. rice, wheat.
2. ***Vanaspati*** - plants bearing fruits without evident flowers.
3. ***Vraksha*** - tress bearing both flowers and fruits.
4. ***Guccha*** - bushy herbs
5. ***Gulma*** - succulent shrubs
6. ***Trina*** - grasses
7. ***Pratana*** - creepers which spread their stems on the ground
8. ***Valli*** - climbers and twiners.

Plant Taxonomy & Nomenclature

In ancient times, plants were named to mark:

1. Special associations like *Bodhidruma* (*Ficus religiosa*), *Ashoka* (*Saraca indica*) and *Shivashekhara* (*Datura*).
2. Special properties such as medicinal, domestically useful, etc., like *Dadrughna* (*Cassia fistula*), *Arshoghna* (*Amorphophallus campanulatus*), *Kushthanashini* (*somaraji*), *Dantadhavana* (*Acacia catechu*), *Karpasa* (cotton) and *Lekhana* (reed).
3. Morphological characteristics e.g. shape of leaf, number of leaflets in a compound leaf, shape and colour of flowers, etc., like *Ashvaparnaka* (*Shorea robusta*), *Panhcangula* (*Ricinus communis*), *Tripatra* - *Bilva* (*Aegle marmelos*), *Saptaparna* (*Alstonia scholaris*), *Vakrapuspa* (*Sesbania grandiflora*) and *Shatamuli* (*Asparagus racemosus*).
4. Local association and environmental association like *Sauvira* (*Zizyphus jujuba*), *Magadhi* (*Piper longum*), *Vaidehi* (*Piper longum*), *Jalaja*, *Pankeruha* (lotus) and *Maruvaka* (*Ocimum* sp.).
5. Other peculiarities, like *Vakrapuspa* (plant having curved flowers), *Vranari* (enemy of boils) for the plant *Sesbania grandiflora*; *Kantakiphala* (having spiny fruits), *Ghantapuspa* (possessing bell-shaped flowers) and *Mahamohi* (great intoxicator) for the plant *Datura alba*.

According to S. Sundara Rajan, in the ancient Indian texts, the nomenclature of the

plants was generally based on the plant's botanical characters (*paricaya prjnapikasamjna*) and their therapeutic properties (*guna prajnapikasamjna*).

References:

1. HISTORY OF PLANT CLASSIFICATION IN ANCIENT INDIAN SCIENCE Kachare, S.V* and Suryawanshi, S.R**

2. Ancient Indian Botany and Taxonomy by Lalit Tiwari.

Multiple Choice Questions (MCQ):

1. Dravyanamakarana refers to
   a. Drug identification b. Drug nomenclature
   c. Drug evaluation d. Drug collection
   Ans: b. Drug nomenclature
2. The word Paryaya refers to
   a. Antonyms b. Latin Name
   c. Synonyms d. Vernacular names
   Ans: c. Synonyms
3. 7 Criteria for naming a drug is mentioned in
   a. Bhavaprakasha Nighantu b. Kaiyyadeva Nighantu
   c. Madana Pala Nighantu d. Raja Nighantu
   Ans: d. Raja Nighantu
4. Tuntuka a synonym of Shyonaka is an example for
   a. Rudhi b. Upama c. Virya d. Deshokta
   Ans: a. Rudhi
5. Hayamara is a synonym of Karavira is an example for
   a. Rudhi b. Swabhava c. Deshokta d. Itarhwaya
   Ans: b. Swabhava
6. Malayaja is a synonym of Chandana is an example for
   a. Upama b. Swabhava c. Deshokta d. Virya
   Ans: c. Deshokta
7. Chitra Tandula is a synonym of Vidanga is an example for
   a. Swabhava b. Lanchana c. Virya d. Itarahwaya
   Ans: b. Lanchana
8. Coppery young leaves of Ashoka is considered for Tamra Pallava as its synonyms is an example for
   a. Lanchana b. Virya c. Upama d. Rudhi
   Ans: c. Upama

9. Tikshna Tandula a synonym of Pippali is an example for

   a. Virya b. Upama c. Deshokta d. Lanchana

   Ans: a. Virya

10. Rigweda is an oldest treatise belongs to

    a. 4500 BC - 1000 BC b. 1000 BC - 500 BC

    b. c. 500 BC - 100 BC d. 100 AC - 500 AC

    Ans: a. 4500 BC - 1000 BC

11. Apushpa and Pushpini are the classifications available in

    a. Charaka Samhita b. Sushruta Samhita c. Rigveda d. Upanishat

    Ans: c. Rigveda

12. Number of criteria mentioned by Raja Nighantukara for naming any drug are

    a. 5 b. 4 c. 6 d. 7

    Ans: d. 7

13. Father of Taxonomy

    a. Benjamin Franklin b. Carl Linnaeus c. Frank Walcat d. Richard Young

    Ans: b. Carl Linnaeus

14. ICBN refers to

    a. International Community of Biology Network

    b. International Congress of Biological Necessity

    c. International Code of Botanical Nomenclature

    d. International Customized Botanical Network

    Ans: c. International Code of Botanical Nomenclature

15. Correct representation of Latin Name of Manjishta

    a. Rubia Cordifolia b. Rubia cordifolia

    c. rubia cordifolia d. rubia Cordifolia

    Ans: b. Rubia cordifolia

***

Prashasta Bheshaja, Bheshaja Pariksha and Drug evaluation method with correlation as per Pharmacognosy

Contents:

- *Prashasta Bheshaja*
- *Bheshaja Pariksha Vidhi*
- Drug Evaluation Methods

Prashasta Bheshaja

बहुता तत्रयोग्यत्वमनेकविधकल्पना । संपच्येति चतुष्कोऽयं द्रव्याणां गुण उच्यते ॥ च.सू. 9/7

Charaka opines that when a *dravya* possess four important qualities then it is considered as ideal drug.

1. बहुता- बहुता भेषजगुणः, अल्पं हि भेषजं गुणवदप्यविद्यामानमिव असाधकत्वात् ।

चक्रपाणि Commentory on च.सू. 9/7

Dravya should possess maximum potency so that it cures disease in small quantities.

2. योग्यत्व- तत्र प्रतिकर्तव्ये व्याधौ योग्यत्वं तत्र योग्यत्वम् ।

चक्रपाणि Commentory on च.सू. 9/7

The dravya should be useful or suitable in given condition.

3. अनेकविधकल्पना-अनेकविधकल्पना नाना प्रकार स्वरसाद्युपयुक्त कल्पनायोग्यत्वमित्यर्थः, यतः प्राणिनः केचित् स्वरसद्विषः केचित् कल्कद्विष रावमादिः रावं व्याधि स्वभावादपि काचित् कल्पना हिता भवति, यथा-ज्वरे कषाय इत्यादिः तेनानेक कल्पनायोग्यत्वाद्यद्यत्र युज्यते तत्तत्र क्रियते ॥

चक्रपाणि on च.सू. 9/7

The drug should be capable of formulating into various preparations like *Swarasa*, *Kalka* etc. or the drug should be fit to be manipulated acc. to the formulation.

4. सम्पत्-संपदिति कृमिसलिलाद्यनुपहतत्वेन रसादि संपत् ॥ चक्रपाणि on च.सू. 9/7

Drug should be potent qualitatively in terms of its *Rasadi* proportion. It should not be affected by *Krimi* (insects), *Salila* (moisture) etc.

तदेव युक्तं भैषज्यं यदारोग्याय कल्पते । च.सू. 1/134

The ideal *Dravya* (drug) is one which restores normalcy (health) in the body.

प्रशस्त देश संभूतं प्रशस्तेऽहनि चोद्दृतम् । युक्तमात्रं मनस्कान्तं गन्धवर्ण रसान्वितम् ॥
दोषघ्नमग्लानिकरमविकारि विपर्यये । समीक्ष्य दत्तं काले च भेषजं पाद उच्यते ॥
सु.सू. 34/22-23

Sushruta opines :

- *Prashasta Desha Sambhuta* - Grown in good region.
- *Prashaste Ahani Chodhrata* - Produced on a good day.
- *Yukta matra* - Given in proper dose.
- *Manaskanta* - Pleasing to mind.
- *Gandhavarnarasanvita* - Having proper odour, colour & taste.
- *Doshaghna* - Relieves vitiated *Doshas.*
- *Aglanikara* - Should not cause any discomfort.

If a drug possesses all these qualities then it may be considered as *Prashasta Bheshaja.*

बहुकल्पं बहुगुणं सम्पन्नं योग्यमौषधम् ॥ अ.हृ.सू. 1/28

Vagbhatacharya also opines that a drug should possess four important qualities.

(i) ***Bahukalpa*** - Possible to prepare different formulations not like that of *Lavana Rasa.*

(ii) ***Bahuguna*** - Should have maximum qualities or should possess qualities with which it can cure the disease.

(iii) ***Sampanna*** - Collected from *Prashasta bhumi* and posses maximum potency.

(iv) ***Yogya*** - Should be eligible to administer in specific conditions.

Bheshaja Pariksha Vidhi

करणं पुनर्भेषजम् । भेषजं नाम तद्यदुपकरणायोपकल्पते भिषजो धातुसाम्याभिनिर्वृत्तौ प्रयतमानस्य विशेषतश्चोपायान्तेभ्यः । तद्द्विविधं व्यापाश्रयभेदात्–दैवव्यपाश्रयं, युक्तिव्यापश्रयं चेति ।.......युक्तिव्यपाश्रयं–संशोधनोपशमने चेष्टाश्च दृष्टफलाः । एतच्चैव भेषजमङ्गभेदादपि द्विविधं–द्रव्यभूतम्, अद्रव्यभूतं च ।.... यत्तु द्रव्यभूतं तद्वमनादिषु योगमुपैति । तस्यापीयं परीक्षा– इदमेवंप्रकृत्यैवंगुणमेवंप्रभावमस्मिन् देशे जातमस्मिन्नृतावेवं गृहीतमेवं निहितमेवमुपस्कृतमनया च मात्रया युक्तमस्मिन् व्याधावेवंविधस्य पुरुषस्यैवतावन्तं दोषमपकर्षत्युपशमयति वा, यदन्यदपि चैवंविधं भेषजं भवेत्तच्चानेन विशेषेण युक्तमिति ॥ (च.वि. 8/87)

Concept of *Bheshaja Parikasha* (Examination of medicaments) is very well explained in Charaka Samhita (Ref: Vimanasthana 8/87) under the context of *Dashavidha Pariksha.* To bring back the normalcy medicine is used as equipment. Basically the *Chikitsa* is of two types viz: *Daiva vyapashraya* (Spiritual) & Yukti Vyapashraya (Realistic). Yuktivyapashraya (Realistic) includes Samshodhana (Purificatory) and Uapashamana

(Pacifying). Again it is of two types viz: Dravyabhuta (Material) and Adravyabhuta (Non-material). Dravyabhuta (Material) chikitsa is one where in Bheshaja (medicines) are used to perform emesis etc. The medicines, especially plant materials which are used for treatment are to be examined for its quality, safety and utility.

1. *Idamevam Prakruti* - Drug should be examined for specific characteristics.
2. *Evam Guna* - To examine their respective properties.
3. *Evam Prabhava* - To examine their specific actions.
4. *Asmin Deshe Jaata* - Whether grown in a specific region.
5. *AsminRutu* - Whether collected during specific season.
6. *Evam Grahita* - Whether collected at right and specific time.
7. *Evam Nihitam* - Whether preserved through right mode.
8. *Evam upaskritamanaya* - Whether processed in a specific method.
9. *Ca Maatraya* - What are the right doses to be administered in various conditions
10. *Yuktamasmin vyaadhaavevam vidhasya Purushasyaivataavantam doshamapakarshayatyupashamayanti* - To examine measured effect on *Dosha* or *Dhatu* and their pharmacological actions.

Various pharmacognostic evaluation methods of a crude drug and latest technologies can be brought under the heading of *Bheśhaja Pariksha* viz:

1. Biological source and family
2. Habitat or geographical sources
3. Cultivation, collection and processing.
4. Morphological characters
5. Microscopical features
6. Various Physicochemical tests
7. Phytochemical analysis
8. Pharmacological actions
9. Pharmaceutical studies
10. Study the varieties
11. Study of substitutes and adulterants
12. Quality control tests etc.

Drug Evaluation Methods

(i) Morphological or Organoleptic tests - It includes morphological appearance and taste, smell, texture, size, fractures etc.

(ii) Microscopic evaluation - Microscopical evaluation which includes presence of stoma, trichomes etc.

(iii) Chemical evaluation - Evaluation of the drug for the presence of Alkaloids, Saponins, Tannins, Glycosides, Flavonoids etc.

(iv) Physical evaluation - It includes evaluation for Moisture content, Loss on drying, Solubility, Refractive index, Ash value, foreign matter etc.

(v) Chromatography - Thin layer chromatography (TLC) or High performance thin layer chromatography (HPTLC).

(vi) Spectrophotometry - Ultra violet and visible Spectrophotometry, Infrared Spectroscopy etc.

(vii) Radio Immuno Assay (RIA)

(viii) Biological evaluation-Hypoglycaemic activity, Anti-inflammatory activity etc.

Multiple Choice Questions (MCQ)

1. Number qualities mentioned for Utttama Dravya are

   a. 5 b. 7 c. 4 d. 8

   Ans: c. 4

2. Not the quality of Dravya mentioned is

   a. Bahuta, b. Yogyatva,

   b. Anekavidha Kalpana d. Krimiyukta

   Ans: d. Krimiyukta

3. The ideal *Dravya* (drug) is one which

   a. Restores the normalcy b. Aggravates Dosha

   c. Vitiates Dhatu d. Cause discomfort

   Ans: a. Restores the normalcy

4. Concept of Bheshaja Pariksha is mentioned in

   a. Charaka Sutrasthana b. Charaka Vimana Sthana

   c. Charka Chikitsa Sthana d. Charaka Nidana Sthana

   Ans: b. Charaka Vimana Sthana

5. *Asmin Deshe Jaata* in *Bheshaja Pariksha* refers

   a. Grown in a specific region b. Processed in specific region

   c. Preserved in specific direction d. Grown burial ground

   Ans: a. Grown in a specific region

6. *Asmin Rutu* in Bheshaja Pariksha refers

   a. Grown in a specific region b. Collected during specific season

   c. Preserved through right mode d. Processed in a specific method

   Ans: b. Collected during specific season

7. Evaluation of the drug for the presence of Alkaloids, Saponins is called

   a. Microscopic evaluation b. Physical Evaluation

   c. Biological Evaluation d. Chemical Evaluation

   Ans: d. Chemical evaluation

8. Evaluation for Moisture content, Loss on drying, Solubility etc. are included under
   a. Biological evaluation
   b. Physical evaluation
   c. Chemical evaluation
   d. Macroscpic evaluation

   Ans: b. Physical evaluation

9. Evaluation which includes presence of stoma, trichomes etc. are included under
   a. Physical evaluation
   b. Chemical evaluation
   c. Microscopic evaluation
   d. Macroscopic evaluation

   Ans: c. Microscopic evaluation

10. Evaluation for Hypoglycaemic activity, Anti-inflammatory activity etc. are considered as
   a. Chemical evaluation
   b. Physical evaluation
   c. Microscopic evaluation
   d. Biological evaluation

   Ans: d. Biological evaluation

*****

Dravyasangrahana and Drug collection methods as per GFCP (Good Field collection practices)

Contents

- Relevance of *Dravya Sangrahana* (Collection of plants)
- *Sangrahita Dravya Swarupa* (Characteristics of collected materials)
- *Sangrahana Vidhi* (Collection methods)
- Collection of Wet or Dry and New or Old Drugs
- *Audbhida Dravya - Avayava Bheda Sangraha Vidhi* (method of collection as per useful parts)
- *Sangraha Kala Jnana* (Knowledge of collection time)
- Collection of used parts acc to season
- *Virya Bhedena Dravyanam Sangrahanam* (Collection of plants as per potency)
- *Dravya Sangrahana as per Bhumi* (Collection according to soil)
- Drug collection methods as per GFCP (Good Field collection practices)
- Guidelines as per Good Field collection practices

Relevance of *Dravya Sangrahana* (Collection of plants)

Collection of plants is an important stage for further processing and formulating medicines. Whether from the wild or cultivated, Collection follows a method and is based on various criteria. Drugs are collected suitably when they contain maximum concentration of active constituents. The advantage of existing environmental conditions is also taken into consideration while collecting the crude drugs.

A few criteria on the basis of which drugs are collected:

(i) Part of the plant	(ii) Season	(iii) Time
(iv) Method	(v) Purpose	(vi) Drug potency

Sangrahita Dravya Swarupa (Characteristics of collected materials)

तस्यां जातमपि कृमिविष शस्त्रातपपवनदहनतोयसंबाधमार्गेसुपहतमेकरसं पुष्टं पृथ्ववगाढमुलमुदीच्यां चौषधमाददीतेत्येष भूमिपरीक्ष विशेषः सामान्यः ॥ सु.सू. 36/3

The drugs which are to be collected should be grown in the previous described *Prashasta Bhumi*.

These drugs should posses the following characteristics-

(i) *Krmi Anupahata*	→	Not affected or infested.
(ii) *Visha Anupahata*	→	Not affected by Toxins.
(iii) *Shastra Anupahata*	→	Not affected by weapons or should be fully grown plant.
(iv) *Atapa Anupahata*	→	Not affected by extreme heat.
(v) *Pavana Anupahata*	→	Not affected by wind/storms.
(vi) *Dahana Anupahata*	→	Not affected by fire.
(vii) *Toya Anupahata*	→	Not affected by water/moisture
(viii) *Sambadha Anupahata*	→	Not affected by other problems.
(ix) *Margoranupahata*	→	Not destroyed/damaged by rampage.
(x) *Ekarasam (Utkrashtarasam)*	→	Best quality.
(xi) *Pushta*	→	Well grown and nourished.
(xii) *Prathu (Prathu Valkalam)*	→	Plant should possess abundant bark.
(xiii) *Avagadha mūla*	→	Deep rooted.

Such plants are only selected. The required part of such plants is collected from *Udichya* (*Uttara*) northern direction.

Sangrahana Vidhi (Collection methods)

गृह्णीयात्तानि सुमनाः शुचिः प्रातः सुवासरे । आदित्यसंमुखो मौनी नमस्कृत्य शिवं हृदि ।

साधारणधराद्रव्य गृह्णीणयदुत्तराश्रितम् ॥ (शा.प्र.1/56-57)

वल्मीककुत्सितानूपश्मशानोषरमार्गजाः । जन्तुवन्हिहिमव्याप्ता नौषध्यः कार्यसिद्धिदाः ॥

शा.प्र. 1/58

(i) Drugs should not be collected from region which have abundant *Valmika*, (ant hill), *Anupa* (Watery/marshy area), *Smashana* (Grave yards), *Ushara* (alkaline), *Margaja* (streets), & *Kutsita* (Dirty place).

(ii) Drugs should not be affected by *Jantu* (insects or germs), *Vahni* (fire) and *Hima* (moisture).

(iii) Person should collect during early morning hours, with a pure conciousness, neat and tidy mentally and physically. While collecting, person should be quite and facing east or northward and collect the drug with due prayers to *Shiva*.

(iv) *Dipika* comments that *Uttarashrita* means collect roots which are situated in the northern direction.

Collection of Wet or Dry and New or Old Drugs

सर्वाण्येव चाभिनवानि, अन्यत्र मधु घृत गुड पिप्पली विडङ्गेभ्यः ।
विडङ्गं पिप्पली क्षौद्रं सर्पिश्चाप्यनवं हितम् । शेषमन्ययत्वभिनवं गृह्णीयद्दोषवर्जितम् ॥
(सु.सू. 36/7-8)

All drugs should be collected Nava (new) i.e drugs should be collected immediately after they are full grown and mature. These are best for usage. A few exceptions are usage of *Vidanga, Pippali, Kshoudra, Sarpi* which are used when *Purana* (old). These old drugs should be devoid of *Dosha.*

नवान्येव हि योज्यानि द्रव्याण्यखिलकर्मसु । विना विडङ्गकृष्णाभ्यां गुडधान्याज्यमाक्षिकैः ॥
शा.प्र. 1/44

All drugs are to be used when new, except *Vidanga, Krishna (Pippali), Guda, Dhanya, Ajya (Sarpi), Makshika (Madhu).* Which are to be used old. *Purana* means only one year old.

गुडूची कुटजो वासा कूष्माण्डं च शतावरी । अश्वगन्धा सहचरी शतपुष्पा प्रसारिणी ॥
प्रयोक्तव्या सदैवार्द्रा द्विगुणा नैव योजयेत् । शुष्कं नवीनं यद्द्रव्यं योज्यं सकलकर्मसु ॥
आर्द्रं च द्विगुणं युज्यादेष सर्वत्र निश्चयः ॥ (शा.स.प्र. 1/45-46)

All *dravyas* should be dry and new, except *Guduchi, Kutaja, Vasa, Kushmanda, Shatavari, Ashwagandha, Sahachara, Shatapushpa & Prasarini.*

Audbhida Dravya - Avayava Bheda Sangraha Vidhi (method of collection as per useful parts)

(1) Leaves

Collection time : Leaves are collected from the plants during the following period as in this season plant is very active, the sap movement and photosynthetic activity are maximum and leaves contain maximum percentage of active constituents.

Weather condition: As the moisture decreases their constituents, they are collected in dry weather.

Method of collection: Method of collection of leaf drugs is characteristic of each drug.

Examples

1. ***Swarnapatri (Cassia ngustifolia)*** - Leaves picked up individually from plant.
2. ***Brahati (Solanum indicum), Kantakari (Solanum xanthocarpum)*** - Leaves with flowering tops is collected.

(2) Bark

Collection Time: Barks are collected only after 3-8 yrs. of plant growth. Bark is usually collected in spring or early summer. In this season, cambium is active and barks get easily separated at cambium.

Method of Collection: Bark is collected by making suitable longitudinal and transverse incisions on the stem/root of plant.

Different methods

(i) Felling -The tree is felled at base by an axe and bark is stripped off. This is a primitive method.

(ii) Uprooting -Stems of tree of definite age & diameter are cut down and then stripped off.

(iii) Coppicing -Stems of plants of definite age and diameter are cut at a certain distance above the ground and bark is collected. From the stumps above soil, new shoots arise.

Examples

(i) *Arjuna* (***Terminalia arjuna***) - Outer surface-dark brown, rough with cracks and fissure. Inner surface-Dark brown to black longitudinally striated.

(ii) *Ashoka* (***Saraca indica***) - Outer-rough with warty protuberances and rusty brown. Transverse and longitudinal cracks are seen. Inner surface is smooth. soft and reddish brown.

(3) Seed

Collection Time: when fruits are ripe but before they dehisce on plant.

Method of collection: It varies according to the plant.

Examples

1. ***Kupilu*** (***Strychnos nux-vomica***) - Ripe fruits are collected and seeds are removed.
2. ***Eranda*** (***Ricinus communis***) - Capsules are collected from plants when they begin to turn brown. These capsules are exposed to sun. After 3-4 days. capsules burst suddenly and seeds flung out violently.

(4) Fruit

Time of collection: The suitable time is early autumn or when ripe but still firm. Sometimes when the oldest fruits are just ripe, fruits are harvested.

Condition: Early morning hours

Method of Collection:

- Picked individually or cut in branches.
- Sometimes, reaping machines are also used.

Note: Over ripe fruits are not to be collected as they may not dry properly.

Examples:

1. **Fennel (*Foeniculum vulgare*)** - Stems are cut with a sickle and dried in sun. Fruits are beaten on a cloth in the sun.
2. **Caraway (*Carum carvi*)** - When the oldest fruits are just ripe, the crop is harvested with a reaping machine, choosing the early morning. These are allowed to dry for 2-3 weeks and later fruits are separated in threshing machine.

(5) Flowers

Time of collection: Usually in spring or summer, collection of flowers must be done about the time of pollination.

Condition during collection: In fine, dry weather and in the fore noon after few hours of sunshine when dew has dissipated. (Petals which are damp when gathered become badly discoloured during drying).

They are dried in shade as sun bleaches the flowers and makes them paler.

Examples:

1. **Člove (*Syzigium aromaticum*):** Clove buds are at first white, then green and finally become crimson-red in colour. Before the corolla expands, crimson red buds are picked out in dry weather.
2. **Saffron (*Crocus sativus*):** Collection made about sunrise in fine weather during September and November. Flowers are handpicked and put into baskets, later stigmas are removed and corollas rejected.

(6) Stem

Time of collection: Stems are collected after the plant has begun to flower. This is because during this time, the plant puts most effort for growth.

Method of collection

Annual plants: Stems from annual plants are collected by cutting them 5-10 cm above ground.

Perinneal plants: In perinneal plants, stems are cut higher above ground to encourage further crops.

Example:

***Chirata* (*Swertia chirata*)**-The entire plant is collected when the flowering is well advanced.

(7) Root/Rhizome/Corm/Bulb (Any underground part)

Time of collection: Roots are collected only after plant growth. Root is usually collected during summer or autumn (autumn in temperate countries). Else, any underground part should be harvested when the plants have borne fruits, shed seeds and arial parts have started to wither.

Roots from annual plants are generally not collected. Reason for this time:

- High active chemical composition is seen when vegetable growth is ceased.
- They are fully mature, developed and of good quality.
- As plants have already shed seeds, crop continues in next season through natural regeneration.

Examples

1. **Liquorice (*Yashtimadhu - Glycyrrhiza glabra*)** -In the third year, when leaves fall, the plants are dug up, buds and rootlets are removed and the roots and stolons are dried rapidly in the sun and finally in a heated chamber.
2. ***Vacha* (*Acorus calamus*)** -The long, creeping horizontal rhizome is collected in autumn, trimmed, cut into pieces of 10 cm and dried.

(8) Heart wood (wood)

A large portion of most commercial woods consists of heart wood by which is understood xylem tissue which consists of dead cells which has ceased to perform any conduction.

Examples:

1. ***Chandana* (*Santalum album* - Sandalwood)**-Trees which are more than 25yrs of age is normally selected for collection. Tree is uprooted and roughly deprived of its bark and part of sap wood.

(9) Sap/Latex

Sap is collected in the spring as it rises or as it tails in Autum.

(10) Galls

Galls are pathological out growths formed on the twigs of trees. Galls are collected before the escape of the insect or during August & September.

Sangraha Kala Jnana Jnana (Knowledge of collection time)

अत्र केचिदाहुराचार्याः प्रांवृड्वर्षाशरद्धेमन्तवसन्तग्रीष्मेषु यथा संख्यं मूलपत्रत्वक् क्षीरसार-फलान्याददीतेतिः तत्तु न सम्यक् । सु.सू. 46/5

Acharya Sushruta gives a cross reference for time of drug collection. He quotes a ref., where in different parts of a plant are collected during specific season. *Acharya*

Sushruta does not agree to this.

तेषां शाखापलाशमचिरप्ररूढ़ं वर्षावसन्तयोर्ग्राह्य, ग्रीष्मे मूलानि शिशिरे वा शीर्णप्ररुढ़पर्णानां,शरदि त्वक्कन्द क्षीराणि, हेमन्ते साराणि, यथर्तु पुष्पफलमिति । (च.क. 1/10)

कन्दं हिमर्तौ शिशिरे च मूलं पुष्पं वसन्ते गुणदं वदन्ति ।

प्रबालपत्राणि निदाधकाले स्युः पङ्कजातानि शरत्प्रयोगे ॥ (रा.नि. धरण्यादि वर्ग-57)

Ritu	Ref. in *Sushruta*	*Charaka*	Ra. Ni
Vasanta (Mar. 16 -May 15)	*Sara*	*Shakha, Patra*	*Pushpa*
Grishma (May 16 - July 15)	*Phala*	*Mula*	-
Pravrat (July 16 - Aug. 15)	*Mūla*	-	-
Varsha (Aug. 16 - Sept. 15)	*Patra*	-	*Prabala Patra*
Sharad (Sept.16 - Nov. 15)	*Twak*	*Twak, Kanda, Kshira*	*Pankajata*
Hemanta (Nov16 - Jan.15)	*Kshira*	*Sara*	*Kanda*
Shishira (Jan16 - March15)	-	*Mula*	*Mula*

Collection of used parts acc to season

The following table shows the difference in opinion of different scholars about time of collection.

Sl. No.	*Prayojyanga*	*Charaka*	*Sushruta*	Ra. Ni
1.	*Mula (Root)* (शीर्णप्ररुढ़पर्णानां)	*Grishma, Shishira*	*Pravrat*	*Shishiira*
2.	*Palasha* (Newly developed leaves)	*Varsha , Vasanta*	-	-
3.	*Shaka* (Branches)	*Varsha, Vasanta*	-	-
4.	*Pushpa* (Flowers)	Acc to flowering season	-	*Vasanta*
5.	*Twak* (Bark)	*Sharad*	*Sharad*	-
6.	*Kshira* (Latex)	*Sharad*	*Hemanta*	-
7.	*Sara* (Heart wood)	*Hemanta*	*Vasanta*	-
8.	*Phala* (fruit)	Acc to fruiting season of plant	*Grishma*	*Vasanta*
9.	*Kanda* (stem, root tubers/bulb)	*Sharad*	-	*Hemanta*
10.	*Patra* (Leaves)	-	*Varsha*	*Shishira*
11.	*Panchanga* (Whole plant)	-	-	*Sharad*

Virya Bhedena Dravyanam Sangrahanam (Collection of plants as per potency)

Acharya Sushruta disagrees with the previously described drug collection based on season and puts forth the following theory.

He says,

तत्तु न सम्यक्, सौम्याग्नेयत्वाज्जगतः । सौम्यान्यौषधानि सौम्येष्वधृर्तुष्वाददीत, आग्नेयान्याग्नेयेषु, रावमप्यापन्नगुणानि भवन्ति । सौम्यान्यौषधानि सौम्येष्वृर्तुषु गृहीतानि सोमगुणभूयिष्ठायां भूमौ जातन्यतिमधुरस्निग्ध शीतानि जायन्ते । रातेन शेषं व्याख्यातम् । (सु.सू. 36/5)

As the entire universe is composed of *Saumya* and *Agneyatva,* hence *Saumya dravyas* have to be collected from *Saumya Ritu. Agneya dravyas* are collected during *Agneya Ritu.*

A *Saumya dravya* collected during *Saumya Ritu* which was grown from a *Saumya Bhūmi* will possess *Atimadhura*, *Snigdha* & *Shita guna*.

Dravya	Ritu	Bhumi	Dravya-Guna
Saumya	*Varsha, Hemanta & Shishira*	Saumya	Atimadhura, Snigdha & Shita
Agneya	*Sharad, Vasanta & Grishma*	*Agneya*	*Katu, Ruksha & Ushna*

आग्रेय विन्ध्यशैलाद्याः सौम्यो हिमगिरिर्मतः । अतस्तदौषधानि स्युरनुरुपाणि हेतुभिः ॥
अन्येष्वपि प्ररोहन्ति वनेषूपवनेषु । शा.प्र. 1/55

This is a reference from *Sharngadhara* who advocates collection of *Agneya* and *Saumya dravya* from specific regions.

Agneya Dravya (Ushna Virya Dravya) should be collected from *Vindhya, Malaya, Shaila Parvata* (region). As these regions have an ecological features which is *Agneya* and hence *Ushna Virya Dravyas* collected from here will be excellent.

Saumya Dravya (Shita Virya Dravya) is to be collected from *Himagiri* (Himalayan regions) as the ecological condition is *Saumya.*

Type of *Dravya*	Region
Agneya	Vindhya, Malaya etc.
Saumya	Himigiri

The same concept has to be adapted to *Vana* & *Upavana* also. Depending on the prevailing ecological conditions of the forest/garden, respective drugs have to be collected.

Dravya Sangrahana as per Bhumi (Collection according to soil)

Bhumi :

तत्र प्रथिव्यम्बुगुण भूयिष्ठायां भूमौ जातानि विरेचन द्रव्याव्याददीत अग्नयाकाशमारुतगुण भूयिष्ठायां वमन द्रव्याणि, उभयगुण भूयिष्ठायामु भयतोभागानि, आकाशगुणभूयिष्ठायां संशमनानि रावं बलवत्तराणि भवन्ति ॥ सु.सू. 36/6

Dravyas are collected from specific types of soils for specific purposes.

Sl.No.	*Bhumi*	Purpose
1.	*Prathvi + Ambu Gunabhuyishtha*	*Virechana Dravya*
2.	*Akasha + Maruta + Agni*	*Vamana Dravya*
3.	*Ubhaya Gunabhuyishtha*	*Ubhayabhagahara*
4.	*Akasha Gunabhuyishtha*	*Samshamana Dravya*

- *Virechana dravyas* should be procured from soil which is predominant with *Prithvi* & Ap *Mahabhuta.*
- *Vamana dravyas* should be collected from soil which posses the qualities of *Agni, Vayu & Akasha.*
- *Ubhaya bhagahara dravyas* are to be collected from soil having *Prithvi, Ambu, Agni, Vayu & Akasha guna.*
- *Samshamana dravyas* should be collected from soil which posses *Akasha Guna.*

Good Field Collection Practices (GFCP)

Definition

The Good field collection practices for Indian medicinal plants intend to provide India specific guidelines for sustainable collection of wild medicinal plants and seek to address issues associated with harvesting and post-harvest management.

NMPB has developed GFCP based on the WHO guidelines and have been adapted to the Indian environment.

Need

There is a relentless rise in global demand for plant-based medicines and herbal products. With increasing demand, come challenges of sub-standard raw material, adulteration, substitution. These lead to concerns in quality, safety and efficacy of herbal raw material and herbal formulations. Lack of appropriate knowledge about the genuine sources, harvesting and post harvesting practices are one of the major contributory factors for sub-

standard raw materials. In addition, unscientific collection of medicinal plants from wild sources will lead to loss of biodiversity. Hence there is a need for sustainable harvesting and long-term conservation of wild medicinal plants. This can be achieved by adopting good collection practices and up-skilling the collectors about the same. In addition to conservation and sustainable utilization, these practices ensure fair trade for the collectors with equitable returns.

Guidelines as per Good Field collection practices

1. Regulatory requirements for sustainable harvesting of medicinal plants from wild
2. Harvesting of medicinal plant produce
3. Post-harvest management.
4. Packaging and storage
5. Guidelines for collection and post-harvest management of various categories of Medicinal Plant Produce
6. Documentation
7. Training and monitoring

1. **Regulatory requirements for sustainable harvesting of medicinal plants from wild** - The collection, processing, storage and sale of medicinal plant produce must be carried out in accordance with the existing international, national and regional laws. Collectors/collection managers should be aware of such regulation and their amendments.

a. Provisions lay down in the CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) regulations must be adhered to while collecting any medicinal plant produce from the wild.

b. Government of India has enacted various Acts to ensure conservation and sustainable use of wild resources, like Indian Forest Act 1927, The Wildlife (Protection) Act 1972, The Forest (Conservation) Act 1980, The Biological Diversity Act 2002, The Scheduled Tribes and Other Traditional Forest-Dwellers (Recognition of Forest Rights) Act 2006 which contain provisions related to collection, transit and trade of medicinal plant produce.

c. Majority of the States in India have additional laws enacted and enforced for regulating removal and use forest resources.

d. Permissions- Wherever the provision requires, collectors/collection managers should take prior written permission from the authorized agency for collection, possession, transit and sale of the medicinal plant produce.

2. **Harvesting of medicinal plant produce** - Medicinal plants should be

harvested in such ways and at such rates that do not merely fulfil their commercial needs but also ensure sustainability and produce quality. Collectors/collection managers should adopt following guidelines for harvesting

a. **Quality considerations** - Botanical identity must be established before a plant species is collected from the wild. Only healthy individuals of desired plant species should be harvested. The concentration of biologically active substances varies with the stages of growth and development of plant. In order to ensure optimum quantity of biologically active substances in the medicinal plant produce, the harvesting should be done at appropriate developmental stage. Harvesting should not be done during rain, mist or exceptionally high humid conditions as this would encourage fungal attack. Care should be taken to avoid any accidental mixing of foreign matter with medicinal plant produce.

b. **Environmental considerations** - The collection of medicinal plants from wild may threaten the ecosystem. Regulators (e.g., forest and wild life field officials) as well as the collectors must be aware of the current conservation (RET) status of the desired plant species. The quantity of collection of any plant species should be proportionate with the distribution of the species in the area of collection Medicinal plant species should be harvested within the limits of their capacity for regeneration. Enough gaps should be given between collections for the plant to recoup the harvested parts.

c. **Social considerations** - The social impact of large-scale collection from wild on local communities should be observed to ensure that negative impact on their livelihoods is avoided. In case of organized large-scale collection, care should be taken that local inhabitants get the equitable employment opportunities and wages with fair price and benefit sharing measures.

3. **Post Harvest management**

a. **Primary processing** - Timely and right processing of medicinal plant produce after it has been harvested is imperative to preserve the quality and enhance shelf life. After harvesting, the produce should be separated from any organic or inorganic matter stuck to it. Any part of the mother plant, that does not constitute official medicinal plant produce. (e. g. immature lateral roots where taproot is the officially recognized produce), should be removed. If the soil is attached to the harvested produce, it should be washed with potable water. In some cases, the harvested produce may need to be scraped, peeled or brushed.

b. **Drying** - The medicinal plant produce should be properly dried before it is packed for shipping or storage. In case the harvested produce is thick, fleshy

or of bigger size, it should be cut or sliced into small/ thin pieces to ensure proper drying. If plant is delicate and/or aromatic parts constitute the produce, these should be dried only under shade. In case of open sun or air-drying, the medicinal plant produce must be spread out in a thin layer on a drying frame. Standardised and validated artificial means of drying like oven or hot air may also be used.

4. Packaging and storage

a. **Packaging-** The storage containers of medicinal plant produce must provide protection from heat, humidity and temperature and at the same time should not contaminate the produce. In no circumstance, previously used bags for food articles, construction articles such as cement, sand or that of fertilizers or other chemicals should be used for packing medicinal produce. Each container of medicinal plant produce should be labelled properly.

b. **Storage-** Storage of produce is of utmost importance as inappropriate storage conditions may render the produce unusable, no matter with what care it has been harvested and processed. Medicinal plant produce should be stored in a dedicated storehouse, to avoid entry of rodents, birds and other animals and should be free from dampness, dirt and dust. Properly sealed and labelled containers of medicinal plant produce should be kept preferably on wooden pallets, at cool and dry places.

5. **Guidelines for collection and post-harvest management of various categories of Medicinal Plant Produce-** The whole plant is used as a medicinal plant produce only in a few cases. Often it is one or more part like root, bark, stem, leaves, flowers, fruits, seeds of the species which constitute the officially accepted produce. Some of the important points, which need to be taken care of while harvesting various categories, are given, for example:

a. The roots of annual plants must be dug when the plants are well developed and mature. Roots of perennials should be harvested late in the fall or early in the spring. Underground parts like roots and rhizomes should be collected only after the seed shedding. It also facilitates regeneration of species.

b. Stem bark should not be harvested when the tree is under new growth. As far as possible, the bark should be collected from mature branches of the trees leaving the main trunk intact.

c. The leaves of herbaceous plants should be collected before their flowering, unless otherwise specified. As far as possible, leaves should be collected from mature trees. The source plant should not be ripped off the leaves completely. Certain percentage of leaves should be left to ensure normal physiological processes of the plant.

6. **Documentation-** collectors, supervisors or mangers should ensure that maximum information is recorded during the collection of the produce. Following information may be recorded during harvesting and post-harvest management of medicinal plant produce:

a. The basic information about the plant species, area of collection, time of collection, regulatory information, permits etc. must be captured.

b. The passport data sheet should go to all buyers till the produce is finally processed to make the ASU or the herbal formulations.

c. All processes or events that could affect the quality of the produce.

d. All agreements between collectors (e.g., co-operative society, village Panchayat etc.) with traders and manufacturers.

e. The drying conditions and temperature range, if artificial drying has been employed.

7. **Training and monitoring**

a. Proper training should be given to collectors to ensure collection of quality produce without any negative impact on the environment.

b. Collectors should have received adequate botanical training on areas like - identification of species and their produce, discriminate the morphologically similar looking plants, season of collection and issues related to protection of environment and conservation of plant species.

c. Collectors should be aware of need of personal hygiene and personal safety at collection sites

d. Baseline assessment of availability of medicinal plant produce in wild should be done and regular monitoring should be carried out as a part of routine management plan. The assessment should also be done for sustainable level of harvesting for each species at least for those likely to be threatened in short durations.

Reference & for further reading: Good Field Collection Practices (GFCPs) National Medicinal Plants Board, Department of AYUSH, Ministry of Health and Family Welfare, Government of India, 2009.

Multiple Choice Questions (MCQ)

1. Sangrahita Dravya (Collected material) should not be

   a. Krmi Anupahata b. *Visha Anupahata*

   c. *Atapa Anupahata* d. *Krimi Upahata*

   Ans: d. *Krimi Upahata*

2. As per Charaka the Mula (Root) should be collected in which Rutu
   a. Varsha b. Sharad c. Grishma d. Vasanta

   Ans: c. Grishma

3. As per Charaka the Sara (Heart wood) should be collected in which Rutu
   a. Sharad b. Hemanta c. Varsha d. Grishma

   Ans: b. Hemanta

4. As per Sushruta the Mula (Root) should be collected in which Rutu
   a. Pravrat b. Sharad c. Hemanta d. Vasanta

   Ans: a. Pravrat

5. As per Sharangadhara *Agneya Dravya (Ushna Virya Dravya)* should be collected from
   a. Himalaya b. Vindhya c. Kairata d. Kalinga

   Ans: b. Vindhya

6. As Per Sharangadhara *Saumya Dravya (Shita Virya Dravya)* is to be collected from
   a. Vindhya b. Paschimatya c. Himalaya d. Malaya

   Ans: c. Himalaya

7. As per Sushruta *Virechana dravyas* should be procured from soil which is predominant with
   a. Agni Mahabhuta b. Vayu Mahabhuta
   c. Akasha Mahabhuta d. Prathvi & Ap Mahabhuta

   Ans: d. Prathvi & Ap Mahabhuta

8. The Biological Diversity Act introduced by Government of India in the year
   a. 2005 b. 2002 c. 1995 d. 2015

   Ans: b. 2002

9. GFCP refers to
   a. Good Field Collection Practices b. Good Field Conservation Practices
   c. Good Field Cultivation Practices d. Good Field Clinical Practices

   Ans: a. Good Field Collection Practices

10. Which organization has developed GFCP based on the WHO guidelines and have been adapted to the Indian environment
    a. CDSCO b. NMPB c. CCRAS d. RAV

    Ans: b. NMPB

16 Chapter

GCP (Good cultivation practices), Seed bank, Conservation of medicinal plants, knowledge about RET (Rear, Endangered & threatened) medicinal plants

Content

- Meaning of cultivation
- Necessity of cultivation
- Cultivation methods
- Factors affecting cultivation
- Harvesting
- Processing
- Government efforts to promote cultivation
- Good Cultivation Practices (GCP)
- Seed bank
- Knowledge about Rare, Endangered & Threatened (RET) medicinal plants
- The International Union for Conservation of Nature (IUCN)
- Conservation of medicinal plants
- Types of conservation

Cultivation of Medicinal Plants

Meaning of cultivation: Domestication of medicinal and aromatic plants and subjecting them to systematic cultivation based on modern scientific information.

Necessity of cultivation

1. Due to increase herbal drug demand, there is immense pressure on wild population. Therefore, the alternative means to generate more raw materials could be only through cultivation of medicinal plants in agriculture fields. This will also reduce burden on the wild and helps to conserve the biodiversity.
2. Cultivation ensures quality & purity of medicinal plants. Systematic cultivation results in raising a crop with maximum content of active principles and also avoid contamination from weeds.
3. Cultivation helps in crop-planning, ensures regular supply. Thus industries do not face problem of shortage of raw material.

4. Cultivation leads to industrialization, pave way for cottage & small-scale industries.
5. Cultivation permits application of modern genetic engineering for better species, yield.
6. Cultivation gives a better yield and thereby better therapeutic quality & efficacy.

Cultivation methods

Medicinal plants may be propagated by :

1. Sexual method (seed propagation) - Plants are raised from seeds and such plants are known as seedlings. Eg: cultivation of *Agastya*,
2. Asexual method (vegetative propagation) - The vegetative part of a plant, such as stem or root, is placed in such an environment that it develops into a new plant. Eg: cultivation of *Lashuna* using bulbs, cultivation of *KuCkuma kesara* from corms, cultivation of *Haridra*, ginger from rhizomes, cultivation of *Agnimantha*, *Nirgundi*, *Guduchi* from stem cuttings.

Factors affecting cultivation

Many factors contribute and influence the growth of cultivation of medicinal plants, like :

1. Altitude, temperature, & humidity
2. Rainfall or irrigation
3. Soil & soil fertility
4. Fertilizers
5. Pest & pest control

Harvesting

Irrespective of the type of crude drug, drug harvesting should be suitably done when they contain maximum concentration of active constituents. The advantage of existing environmental conditions is also taken into consideration while harvesting. For example:

- Leaf & flowering tops are to be harvested just before they reach flowering stage (maturity)
- Flowers are harvested just before pollination, in dry weather and during morning hours
- Barks are harvested during spring or early summer when cambium is active

Processing

Before marketing, it is necessary to process the crude drug harvested properly, so as to preserve it for a longer time & also to acquire better pharmaceutical elegance.

1. Drying- consists of removal of sufficient moisture

2. Garbling- (Dressing) - Removal of sand, dirt, foreign organic matter not constituting the drug.
3. Packing- leaves pressed & baled, Asafetida packed in well closed containers.
4. Storage in suitable containers and conditions till they are sent for marketing.

Government efforts to promote cultivation

Government of India established NMPB under Ministry of AYUSH, to coordinate all matters relating to medicinal plants and support policies & programs for growth of trade, export, conservation and cultivation. (For details, Ref Ch 20 on NMPB)

NMPB has developed Good Agricultural Practices for Medicinal plants, guidelines for cultivation of medicinal plants to ensure optimal yield in terms of quality and quantity of herbal raw materials.

Good Cultivation Practices (GCP)

Definition: Good Agricultural and Collection Practices for Medicinal Plants (GACP) are a set of guidelines developed with an aim at improving the quality of medicinal plant material being used in herbal medicines in the market.

NMPB has developed GACP based on the WHO guidelines and have been adapted to the Indian conditions. The guidelines include the following aspects:

1. Soil and climatic conditions
2. Seed and propagation material
3. Crop management for cultivation
4. Harvest and post-harvest management
5. Documentation
6. Personnel and equipment

1. ***Soil and climatic conditions:*** The best possible environment where the plant can express its full potential in terms of both quality and quantity during its entire growth period (germination, growth and maturity) has to be identified.

a. The soil should qualify in terms of overall soil health for the purpose of cultivation

b. The following sites should be avoided: water logging areas, affected with industrial affluents, near to grave yards, crematoria

c. A well-drained fertile soil with optimum level of water holding capacity should be used.

d. Latest soil report on physicochemical parameters and nutrient profile should be obtained, so that soil amendments may be followed.

e. The site must be in close proximity to a reliable irrigation water source

f. The irrigation water must be analysed for heavy metals and residual pesticides.

g. Availability of shade should be ascertained for shade-loving plants.

2. ***Seeds and propagation material:*** Seeds and other propagation materials should be specified, and suppliers of seeds and other propagation materials should provide all necessary information, like, pharmacopoeial nomenclature and trade name, Botanical name, Cultivar, marker based analytical projection

a. When the planting material is obtained from wild resources, efforts should be made to establish its correct identity.

b. Precautions should be taken to ensure quality of seed/ seeding material. To note a few examples, seeds must be physically free from pests, diseases, foreign and inert matter, should be recently collected, use only healthy seedlings/ stem cuttings

3. ***Crop management for cultivation:*** field preparation, sowing and transplanting, use of manures, irrigation, weeding are a few issues to be managed

a. Field preparation- The soil should be brought to the desired tilth to facilitate favourable environment for growing seed and seedling

b. Sowing and transplanting- The optimum stage of transplanting should be monitored. The rate of seedlings, depth, and spacing should be adhered to target species.

c. Manures and fertilizers: Use of organic manure, like compost, vermi-compost, poultry manure, and green leafy manure is preferred for growing medicinal plants. Mineral nutrition through inorganic source may be opted for in consideration of the species needs. Use of sludge, city waste, and night soil must be avoided.

d. Irrigation- The total water requirement of the crop should be estimated and accordingly irrigation cycles should be planned and implemented. Water harvesting and conservation methods should be followed wherever possible.

e. Weeding & intercultural operations- Weeds must be controlled at the seedlings stage itself. Weeding and hoeing cycles should be planned to keep the field free from weeds. The inter-cultural operations such as weeding, hoeing, topping, nipping of buds, pruning, shading and earthing up etc., must be adhered to in a manner to optimize the overall productivity.

f. Crop protection- In general, crop protection plans should be limited to the use of bio-control agents and bio-pesticides. If chemical pesticides are used for crop protection, residue analysis should be carried out.

4. ***Harvest and post- harvest management-*** Should adhere to the principle of

"maximizing sustainable production" by following good practices in harvesting, primary processing, packaging, storage and transportation.

a. Harvesting- The harvesting season should be determined on the basis of the qualitative parameters rather than vegetative yield. Should be harvested only on favorable days avoiding dew or rain. The containers used for harvested materials should be kept clean, to prevent cross contamination.
b. Primary processing- Washing and cleaning methods for freshly harvested materials should ensure removal of adherent soil. This should be followed by drying to prevent degradation or rotting. The processing yards/sites should be clean; well- ventilated and have the facilities for protection against sunlight, dust, rain, rodents, insects and livestock. The drying should be followed by sorting procedure, before the material is packed.
c. Packaging, storage and transportation- The packaging material should be clean, dry, undamaged and suitable for the specific product. The product description giving essential details as the product name, plant part, month and year of harvest and the name of farmer/farming agency must be legibly inscribed on every pack. The storage area should be a dry place protected from insects, rodents and such factors that may be deter the quality of the product.

5. ***Documentation-*** All documents relating to entire cultivation process should be maintained in a manner that ensures easy accessibility and traceability. The contents should be simple and easily comprehensible. The agronomic profile which details all stages of cultivation, appropriate compliance reports like soil quality report, water quality report, details of source of seed collection, procedures adopted for seedling generation, soil preparation, crop management, fertilizer- pesticide usage data, weeding details, photographic records should be documented. These documents must be maintained for 3 or 5 years depending on the type of crop.
6. ***Personnel and Equipment-*** The key persons involved in cultivation must be conversant with all aspects related to the crop and its quality requirements. All personnel involved should have basic exposure and awareness on safety and hygiene. There should be appropriate mechanisms to ensure personnel health. Machinery/equipment utilized should be calibrated and certifications of same maintained. Machinery/equipment must be installed at accessible area and scheduled for regular services with documentation of the same.

Seed bank

Seed bank is one of the methods of *ex-situ* conservation. The main purpose is seed storage. Professionally established and well documented seed collection are not only valu-

able for plant species conservation, but also for providing material for agriculture, horticulture, research, display, education, propagation of plants to reduce pressure from wild harvesting and species reintroduction and habitat restoration programmes.

Community seed banks

Collection of seeds is the most convenient way of germplasm conservation since seeds occupy a relatively small place. In many countries farmers rely on informal seed systems based on local growers' retention of seeds from previous harvests, storage, treatment and exchange of this seed within and between communities. This informal seed sector is based on indigenous structures for information flow and seed exchange. Seed banks managed within this local seed system operate on a small scale at the community level with few resources. These community seed banks and the institutions that support them are extremely important in the preservation of local varieties and for agricultural production. Much could be gained from learning more these seed banks and working with communities to improve them.

However, these community seed banks have a few drawbacks like loss of viability over passage of time and susceptibility to insect and pathogen attack, inability to maintain distinct clones, non-applicability to vegetatively propagated crop.

Seed banks

The most effective method of providing plant genetic resources for long term *ex situ* conservation is through the storage of seeds under very specific conditions, following techniques well developed for crop plants by organizations such as the International Plant Genetic Resources Institute (IPGRI) and the Food and Agricultural Organization of the United Nations (FAO).

The main advantage of seed banking is that it allows large populations to be preserved and genetic erosion to be minimized by providing optimum conditions and reducing the need for regeneration.

The term seed bank sometimes refers to a cryogenic laboratory facility in which the seeds of certain species can be preserved for up to a century or more without losing their fertility. It can also be used to refer to a special type of arboretum where seeds are harvested and the crop is rotated. For plants that cannot be preserved in seed banks, the only other option for preserving germplasm is in-vitro storage, where cuttings of plants are kept under strict conditions in glass tubes and vessels.

The activities in seed banks should take the following sequence: collection, seed preparation, seed drying, packaging, storage, periodic germination tests, seed regeneration, re-storage and documentation at each stage of activity.

The success of long-term conservation of seeds is dependent on continuous viability monitoring and regeneration or re-collection when the viability of the sample drops below a minimum level. The recommended preferred standards recommended by IPGRI for long-term seed storage of orthodox species (seeds which are tolerant to dry and cold temperature) are to dry the seeds to a moisture content of below 7% and seal the dried seeds in a moisture-proof container such as laminated foil bags, aluminium cans or glass jars for storage at a low temperature of -18ĪC. However, because less is known about wild species, a temperature of -4ĪC and moisture content of 7-8% is advisable to begin with. When plant species are recalcitrant (seeds which are not tolerant to dry and cold temperature) or long-term conservation cannot be achieved through seed banking, different methods have been developed with their respective merits, such as field gene banks, in vitro germplasm collections, pollen and DNA banks.

Indian Seed Vault, Chang La, Ladakh is a seed bank built in 2010 jointly by the Defence Institute of High-Altitude Research and the National Bureau of Plant Genetic Resources, and is the second largest seed bank in the world.

Knowledge about Rare, Endangered & Threatened (RET) Medicinal Plants

RET is the acronym for Rare, Endangered and Threatened species on the earth.

The International Union for Conservation of Nature (IUCN) - Established in 1948, IUCN is a membership Union uniquely composed of both government and civil society organizations. Together, they work to advance sustainable development and create a just world that values and conserves nature.

The International Union for Conservation of Nature's Red List of Threatened Species- Established in 1964, it is the world's most comprehensive inventory on the global conservation status of plants and animals. It is a critical indicator of the health of the world's biodiversity. It provides information about range, population size, habitat and ecology, use and/or trade, threats, and conservation actions that will help inform necessary conservation decisions.

The IUCN Red List Categories and Criteria are intended to be an easily and widely understood system for classifying species at high risk of global extinction. Species are assessed against **five criteria** based on

A. Population reduction

B. Restricted geographic range

C. Small population size & decline

D. Very small or restricted population

E. Extinction probability analysis

These criteria determine which category is most appropriate for the species. Based on the above said criteria, it divides species into nine categories:

1. **Not Evaluated (NE)**- When the species has not yet been evaluated against the criteria.
2. **Data Deficient (DD)**- When there is inadequate information to make a direct, or indirect assessment of its risk of extinction based on its distribution and/or population status. Appropriate data on abundance and/or distribution is lacking.
3. **Least Concern (LC)**- The species that has been evaluated against the Red List criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near threatened categories.
4. **Near Threatened (NT)**- When it is evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.
5. **Vulnerable (VU)**- When evidence indicates that it meets any of the criteria A to E for vulnerable (e.g.: probability of extinction in the wild is e"10% in 100 years), and it is therefore considered to be facing a high risk of extinction in the wild.
6. **Endangered (EN)**- When evidence indicates that it meets any of the criteria A to E for endangered (e.g.: probability of extinction in the wild is e" 20% in 20 years), and it is therefore considered to be facing a very high risk of extinction in the wild.
7. **Critically Endangered (CR)**- When evidence indicates that it meets any of the criteria A to E for critically endangered (e.g.: probability of extinction in the wild is e" 50% in 10 years), and it is therefore considered to be facing an extremely high risk of extinction in the wild.

   Threatened species- Species in the Vulnerable, Endangered and Critically Endangered categories are collectively described as 'threatened'.
8. **Extinct in the Wild (EW)**- When it is known only to survive in cultivation, in captivity or as a naturalized population well outside the past range.
9. **Extinct (EX)**- When there is no reasonable doubt that the last individual has died

Rare species is a group of organisms that are very uncommon, scarce, or infrequently encountered. It is different from the term 'endangered' or 'threatened'. These could be naturally low in numbers or restricted in a geographical area. These species are

extremely vulnerable for exploitation or disturbance in their habitat.

Endangered species- When evidence indicates that it meets any of the criteria A to E for endangered (e.g.: probability of extinction in the wild is e" 20% in 20 years), and it is therefore considered to be facing a very high risk of extinction in the wild.

Endangered species are those considered to be at risk of extinction, meaning that there are so few left of their kind that they could disappear from the planet altogether. Endangered species are threatened by factors such as habitat loss, hunting, disease & climate change, usually endangered species have a declining population or a very limited range.

Examples:

S.N.	Species	Parts used	Threat status
1.	Bilva (*Aegle marmelos* (L). Correa)	Fruit, Bark, Root, leaves	Vulnerable
2.	Hydnocarpus pentandrus	Seed	Vulnerable
3.	Kaliyaka (*Coscinium fenestratum* (Goetgh.) Colebr)	Stem, root, fruit	Critically endangered
4.	*Chlorophytum borivilianum*	Tubers	Critically endangered
5.	*Nardostachys jatamansi*	Rhizome	Critically endangered
6.	*Saussurea costus*	Root	Critically endangered
7.	Vidanga (*Embelia ribes*Burm.f.)	Fruit	Vulnerable
8.	*Calophyllum inophyllum L.*	Vulnerable	
9.	Vidari (*Pueraria tuberose* (Willd.) DC.)	Tubers	Critically endangered
10.	Ashoka (*Saraca asoca*(Roxb.)	Stem bark,	Endangered
	Willd.)	flower	
11.	*Decalepis hamiltonii*	Root	Endangered
12.	*Aconitum heterophyllum*	Root tubers	Endangered
13.	*Angelica glauca*	Rhizome	Endangered
14.	Lodhra (*Symplocos racemosa* Roxb.)	Stem bark	Vulnerable
15.	Arjuna (*Terminalia arjuna*(Roxb.) Wight & Arn.)	Stem bark	Near threatened

Conservation of Medicinal Plants

Conservation deals with the study of natural resources and their management for sustainable use and their perpetual existence in their natural habitat. It leads to the understanding and documentation of plants diversity, conserving plant diversity and their sustainable use. Conservation of medicinal plants is an act of careful preservation and protection of natural resources or habitats of medicinal plants especially through planned management.

***Definition of conservation*:** Conservation has been defined as the management of resources of the biosphere for the benefit of all life including human, so that sustainable benefit may be derived by the present with potentials to meet the needs and aspirations of future generations.

Necessity of conservation:

1. At present, several wild medicinal plant species are threatened with extinction. The causes for such threats are numerous, however, some of the most prominent factors contributing to this threat are

a. Heavy biotic pressure

b. Fragmentation

c. Loss and degradation of wild habitat

d. Unsustainable harvesting of these wild species.

2. To ensure sustainability of species & ecosystem.

Types of conservation

The primary goals of biodiversity conservation as envisaged in the World Conservation Strategy can be summarized as follows:

- Maintenance of essential ecological processes and life support systems on which human survival & economic activities depend.
- Preservation of species & genetic diversity &
- Sustainable use of species & ecosystems which support millions of rural communities as well as major industries.

Medicinal plants are potential renewable natural resources. Therefore, conservation & sustainable utilization of medicinal plants must necessarily involve a long term, integrated, scientifically oriented action programme. This should involve the pertinent aspects of protection, preservation, maintenance, exploitation, conservation & sustainable utilization. The most widely accepted scientific technologies of biodiversity conservation are the *in- situ* & *ex-situ* methods.

1. *In-situ* conservation- on the site conservation wherein a wild species or stock of a biological community is protected or preserved in its natural habitat. In India, the conservation of forest areas are preserved through Protected Areas like National Parks, Wildlife Sanctuaries and Biosphere Reserves.

   Eg. Medicinal plants conservation areas (MPCA) - The key activities of MPCA include systematic survey & documentation of intra- specific variation, development of suitable species recovery program of endangered species, strengthening community institution for long term management of sites, training of wildlife staff.

   Sacred groves- These are patches of forest dedicated to local deity whose entire biodiversity along with other natural resources are conserved by the worshippers, the forest village communities.

2. *Ex-situ* conservation- conservation can be accomplished *ex-situ* i.e, outside natural habitat by cultivating and maintaining plants in biotic gardens, parks or long term (seed bank, DNA libraries) and in plant tissue culture repositories. A valuable *ex-situ* conservation measure would be the creating of a network of regional & sub regional ethno-medicinal plant garden.

References & For further reading:

1. Hota. D. Bioactive Medicinal Plants. New Delhi: Gene- Tech books; 2007: 223
2. Ali. M. Pharmacognosy. Vol 2. 1st ed. New Delhi: CBS Publishers & Distributors Pvt.Ltd;2008:568
3. Sharma. R. Agro-techniques of Medicinal plants. Delhi: Daya publishing house;2004:218
4. Medicinal plants: A global heritage. Proceedings of the International conference on medicinal plants for survival;16-19 Feb 1998; Bangalore, India
5. Good Agricultural and Collection Practices for Medicinal Plants (GACP). National Medicinal Plants Board, Department of AYUSH, Ministry of Health and Family Welfare, Government of India, 2009.
6. National Medicinal Plants Board- [Internet] (27.9.2020) https://www.nmpb.nic.in/content/medicinal-plants-cultivation#
7. Choudhary Balram, Goyal Anju , khokra Sukhbir L., Kaushik Pawan, Kaur Navgeet. Contract Farming of Medicinal Plants in India. International Journal of Pharmaceutical Erudition July 2012, 2(2), 1-5 1 https://www.researchgate.net/publication/260926364_Contract_Farming_of_Medicinal_Plants_in_India

8. IUCN 2023 [Accessed on 30 Aug 2023] https://www.iucnredlist.org/
9. Ved, D., Saha, D., Ravikumar, K. & Haridasan, K. 2015. Decalepis hamiltonii. The IUCN Red List of Threatened Species 2015: e.T50126587A50131330. https://dx.doi.org/10.2305/IUCN.UK.2015-2.RLTS.T50126587A50131330.en. Accessed on 30 August 2023.
10. Ved, D., Saha, D., Ravikumar, K. & Haridasan, K. 2015. Aconitum heterophyllum. The IUCN Red List of Threatened Species 2015: e.T50126560A79579556. https://dx.doi.org/10.2305/IUCN.UK.2015-3.RLTS.T50126560A79579556.en. Accessed on 30 August 2023.
11. Ved, D., Saha, D., Ravikumar, K. & Haridasan, K. 2015. Chlorophytum borivilianum. The IUCN Red List of Threatened Species 2015: e.T50126575A50131300. https://dx.doi.org/10.2305/IUCN.UK.2015-2.RLTS.T50126575A50131300.en. Accessed on 30 August 2023.
12. Chauhan, H.K. 2021. Nardostachys jatamansi. The IUCN Red List of Threatened Species 2021: e.T50126627A88304158. https://dx.doi.org/10.2305/IUCN.UK.2021-3.RLTS.T50126627A88304158.en. Accessed on 30 August 2023.
13. Saha, D., Ved, D., Ravikumar, K. & Haridasan, K. 2015. Saussurea costus. The IUCN Red List of Threatened Species 2015: e.T50126641A50131430. https://dx.doi.org/10.2305/IUCN.UK.2015-2.RLTS.T50126641A50131430.en. Accessed on 30 August 2023.
14. Ved, D., Saha, D., Ravikumar, K. & Haridasan, K. 2015. Hydnocarpus pentandrus. The IUCN Red List of Threatened Species 2015: e.T50126615A50131365. https://dx.doi.org/10.2305/IUCN.UK.2015-2.RLTS.T50126615A50131365.en. Accessed on 30 August 2023.
15. http://www.jnkvv.org/PDF/13042020095406Ex%20situ%20conservation.pdf

Multiple Choice Questions (MCQ):

1. IUCN refers to
   a. International Union for Conservation of Nature
   b. International Union for Cultivation in Nature
   c. International Union for Collection in Nature
   d. International Union for Conservation Practices
   Ans: a. International Union for Conservation of Nature
2. IUCN is established in the year
   a. 1936 b.1950 c. 1975 d. 1948
   Ans: d. 1948

3. Sexual and asexual methods are the example for
   a. Collection b. Conservation c. Propagation d. Preparation
   Ans: c. Propagation
4. A group of organisms that are very uncommon, scarce, or infrequently encountered are called
   a. Rare species b. Endangered c. Threatened d. Vulnerable
   Ans: a. Rare species
5. Those species considered to be at risk of extinction, meaning that there are so few left of their kind that they could disappear from the planet altogether are called
   a. Extinct b. Endangered c. Rare d. Extinct in wild
   Ans: b. Endangered
6. When it is known only to survive in cultivation, in captivity or as a naturalized population well outside the past range
   a. Endangered b. Extinct c. Extinct in wild d. Least Concern
   Ans: c. Extinct in wild
7. When there is inadequate information to make a direct, or indirect assessment of its risk of extinction based on its distribution and/or population status then it is called
   a. Endangered b. Extinct in wild c. Extinct d. Data deficient
   Ans: d. Data deficient
8. When there is no reasonable doubt that the last individual has died then it is called
   a. Near Extinct b. Extinct c. Endangered d. Extinct in wild
   Ans: b. Extinct
9. An example for Endangered species
   a. Kanchanara b. Eranda c. Maricha d. Ashoka
   Ans: d. Ashoka
10. Vidanga is an example for
    a. Endangered b. Threatened
    c. Vulnerable d. Critically endangered
    Ans: c. Vulnerable
11. Ativisha is an example for
    a. Threatened b. Endangered
    c. Critically endangered d. Vulnerable
    Ans: b. Endangered

12. Seed bank is one of the methods of — conservation

    a. In-situ b. Ex-situ c. Local d. Difficult method

    Ans: b. Ex-situ

13. The study of natural resources and their management for sustainable use and their perpetual existence in their natural habitat

    a. Cultivation b. Collection c. Conservation d. Utilization

    Ans: c. Conservation

14. Plants are raised from seeds and such plants are known as seedlings is an example for

    a. Asexual method b. Sexual method

    c. Tissue culture d. Micro cultivation

    Ans: b. Sexual method

15. Washing and cleaning methods for freshly harvested materials is an example for

    a. Storage b. Packaging

    c. Primary processing d. Transportation

    Ans: c. Primary processing

*****

Abhavapratinidhidravya (Substitutes)

Content

- *Pratinidhi Dravya* (Substitutes)
- *Abhava pratinidhi dravya* (substitutes) as per Bhavaprakasha.
- List of different species used as a substitute

Pratinidhi Dravya (Substitutes)

Pratinidhi dravya or substitutes means the substances having similar pharmacological activities as like that of genuine drug but may not have similar appearance.

The concept of substitutes is not new; *Bhavamishra* in the context of *Abhava dravyas* has given detail description of the substitutes and enumerated number of substitutes in the absence of the original drug.

Qualities of substitutes

(i) Substitutes should have similar pharmacological actions like that of genuine drugs.

(ii) Should be available easily and in large quantity.

(iii) Should be easy to prepare required formulations.

चित्रकाभावतो दन्ती क्षारः शिखरिजोऽथवा । अभावे धन्वयासस्य प्रक्षेप्या तु दुरालभा ॥
तगरस्याप्यभावे तु कुष्ठं दद्याद्भिषग्वरः । मूर्वाऽभावे त्वचो ग्राह्या जिङ्गिनी प्रभवा बुधैः ॥
अहिंस्त्राया अभावे तु मानकन्दः प्रकीर्तितः । लक्ष्मणया अभावे तु नीलकण्ङ्ग शिखा मता ॥
बकुलाभावतो देयं कह्लारोत्पलपङ्कजम् । नीलोत्पलस्याभावे तु कुमुदं देयमिष्यते ॥
जातीपुष्पं न यत्रास्ति लवंगं तत्र दीयते । अर्कपर्णादि पयसो ह्यभावे तद्रसो मतः ॥
पौष्कराभावतः कुष्ठ तथा लाङ्गल्यभावतः । स्थौणेयकस्याभावे तु भिषग्भिर्दीयते गदः ॥
चविकागजपिप्पल्यौ पिप्पलीमूलवत्सृतौ ॥
अभावे सोमराज्यास्तु प्रपुन्नाड फलं मतम् । यदि न स्याद्दारु निशा तदा देया निशा बुधैः ॥
रसाञ्जन स्यभावे तु दार्वी क्वाथः प्रयुज्यते । सौराष्ट्र्यभावतो देया स्फटिका तद्गुणा जनैः ॥
तालीसपत्रकाभावे स्वर्णताली प्रशस्यते । भाङ्गर्यभावे तु तालीसं कण्टकारीजटाऽथवा ॥
रूचकाभावतो दद्याल्लवणं पांशु पूर्वकम् । अभावे मधुयष्टयास्तु धातकी च प्रयोजयेत् ॥
अम्लवेतसकाभावे चुक्रं दातव्यमिष्यते । द्राक्षा यदि न लभ्येत प्रदेयं काश्मरीफलम् ॥
तयोरभावे कुसुमं मधुकस्य मतं बुधैः । लवङ्गकुसुमं देयं नखस्याभावतः पुनः ॥
कस्तूर्यभावे कङ्कोलं क्षेपणीयं विदुर्बुधाः । कङ्कोलस्याप्यभावे तु जातीपुष्पं प्रदीयते ॥

सुगन्धिमुस्तकं देयं कर्पूराभावतो बुधैः । कर्पूराभावतो देयं ग्रन्थिपर्ण विशेषतः ॥
कुङ्कुमाभावतो दद्यात्कुसुम्भ कुसुमं नवम् । श्रीखण्डचन्दनाभावे कर्पूरं देयमिष्यते ॥
अभावे त्वेतयोर्वैद्यः प्रक्षिपेद्रक्त चन्दनम् । रक्तचन्दनकाभावे नवोशीरं विदुर्बुधाः ॥
मुस्ताचातिविषाभावे शिवाऽभावे शिवा मता । अभावे नागपुष्पस्य पद्मकेशरमिष्यते ॥
मेदाजीवककाकोलीऋद्धि द्वन्द्वेऽपि वाऽसति । वरीविदार्यश्वगन्धावाराहीश्च त्रमात् क्षिपेत् ॥
वाराध्यश्च तथाऽभावे चर्मकारालुको मतः । भल्लातकसहत्वे तु रक्त चन्दनमिष्यते ।
भल्लाता भावतश्चित्रं नलश्चेक्षोरभावतः ॥ भा.प्र.पू. 6/138-159

List of *Pratinidhi Dravyas*

Sl. No.	Genuine Drug	Substitutes
1.	*Chitraka*	*Danti*
2.	*Chitraka*	*Apamarga Kshara*
3.	*Dhanvayasa*	*Duralabha*
4.	*Tagara*	*Kushtha*
5.	*Murva*	*Jingini Twacha*
6.	*Ahimsra*	*Manakanda*
7.	*Lakshmana*	*Mayurashikha*
8.	*Bakula*	*Kahlara*
9.	*Utpala*	*Kumuda*
10.	*Utpala*	*Padma*
11.	*Jatipushpa*	*Lavanga*
12.	*Arkakshira*	*Arkapatra Swarasa*
13.	*Pushkaramūla*	*Kushtha*
14.	*Langali*	*Kushtha*
15.	*Chavika*	*Pippalimula*
16.	*Gajapippali*	*Pippalimula*
17.	*Somaraji*	*Chakramarda*
18.	*Daruharidra*	*Haridra*
19.	*Rasanjana*	*Daruharidra Kwatha*
20.	*Saurashtra Mrat*	*Sphatika*
21.	*Talisapatra*	*Swarnatali*
22.	*Bharangi*	*Talisa*
23.	*Bharangi*	*Kantakari Mula*

24.	*Ruchaka Lavana*	*Pamshu Lavana*
25.	*Madhuyashti*	*Dhataki*
26.	*Amlavetasa*	*Chukra*
27.	*Draksha*	*Kashmariphala*
28.	*Kashmariphala*	*Madhukapushpa*
29.	*Nakha*	*Lavanga Kusuma*
30.	*Kasturi*	*Kankola*
31.	*Kankola*	*Jatipushpa*
32.	*Karpura*	*Sugandhimusta*
33.	*Karpura*	*Granthiparna*
34.	*Kumkuma*	*Kusumbhakusuma*
35.	*Srikhandachandana*	*Karpura*
36.	*Shweta Chandana*	*Raktacandana*
37.	*Rakta Chandana*	*Navoshira*
38.	*Ativisha*	*Musta*
39.	*Haritaki*	*Amalaki*
40.	*Nagakeshara*	*Padmakeshara*
41.	*Meda & Mahameda*	*Shatavari*
42.	*Jivaka & Rushabhaka*	*Vidari*
43.	*Kakoli & Kshirakakoli*	*Ashwagandha*
44.	*Riddhi & Vraddhi*	*Varahi*
45.	*Varahi*	*Charmakaralu*
46.	*Bhallataka Asahyatwa*	*Rakta Candana*
47.	*Bhallataka*	*Chitraka*
48.	*Ikshu*	*Nala*

List of different species used as a substitute:

Sl. No.	Dravya	Original Species	Substitutes
1.	*Vacha*	*Acorus Calamus*	*Alpina galanga*
2.	*Mamira*	*Coptis teeta*	*Thalictrum foliolosum*
3.	*Markandika*	*Cassia angustifolia*	*Pluchea lanceolata*
4.	*Jatamansi*	*Nardostachys jatāmansi* .	*Valeriana officinalis*
5.	*Katuki*	*Picrorrhiza kurroa*	*Gentiana kurroa*

6.	*Sarpagandha*	*Rauwolfia serpentina*	*Rauwolfia tertraphylla*
7.	*Mandukaparni*	*Centella asiatica*	*Hydrocotyle javanica*
8.	*Chandana*	*Santalum album*	*Ximenia americana*
9.	*Sariva*	*Hemidesmus indicus*	*Smilax aspera*
10.	*Apamarga*	*Achyranthes aspera*	*Achyranthes bidentata*
11.	*Daruharidra*	*Berberis aristata*	*Coscinium fenestratum*
12.	*Kapikacchu*	*Mucuna pruriens*	*Mucuna utilis*
13.	*Nagakeshara*	*Mesua ferrea*	*Calophyllum inophyllum*
14.	*Shatavari*	*Asparagus racemosus*	*Asparagus officinalis*
15.	*Tulasi*	*Ocimum sanctum*	*Ocimum basilicum*

Apamishrana Jnanam (Adulteration)

Adulteration is a practice of replacing original crude drug partially or wholly with other similar looking substances but the later is either free from or inferior in chemical and therapeutic properties.

Reason for Adulteration

(i) With the intention of enhancing the profits
(ii) Scarcity of the drug
(iii) High price in prevailing market
(iv) Accidental because of improper identification

Types of Adulterants

(i) Adulteration with substandard commercial varieties - where adulterant resemble original drug morphologically, chemically but substandard and cheaper.
E.g.: Indian senna replaced with Arabian senna.

(ii) Adulteration with superficially similar inferior drugs - only with morphological resemblance these are used as an adulterant.

(iii) Mixing with artificially manufactured substances. Artificially prepared substance which resemble original drug is mixed.
E.g.: Paraffin wax made yellow coloured and adulterated for bees wax.

(iv) Mixing with exhausted drugs - Mixing of substances which are devoid of therapeutic activities.
E.g.: Artificial colour of exhausted saffron.

(v) Using synthetic drugs: Synthesized chemicals are used to enhance natural characters.
E.g.: Citral is an adulterant for lemon oil.

(vi) Presence of vegetable matter of same plant. A part of same plant which is devoid of therapeutic action is mixed.

E.g.: Stem portion of *Dhatura(Dhatura metal)* is mixed with leaf.

Detection of Adulteration

Adulteration may be evaluated by following methods or steps.

(i) Morphological or Organoleptic tests.

(ii) Microscopic evaluation - Presence of stoma, trichomes etc.

(iii) Chemical evaluation - Presence of Alkaloids, Saponins etc.

(iv) Physical evaluation - Moisture, Solubility, Refractive index, Ash value, foreign matter etc.

(v) Chromatography?Thin layer chromatography (TLC) or High performance thin layer chromatography (HPTLC).

(vi) Spectrophotometry - Ultra violet and visible Spectrophotometry, Infrared Spectroscopy etc.

(vii) Radio Immuno Assay (RIA)

(viii) Biological evaluation-Hypoglycaemic activity, Anti-inflammatory activity etc.

Adulterants for the Drugs

Sl. No.	Drug Name	Genuine Source	Adulterant
1.	*Ashoka*	*Saraca asoca*	*Polyalthia longifolia*
2.	*Bhumyamalaki*	*Phyllanthus niruri*	*Phyllanthus maderaspatensis*
3.	*Daruharidra*	*Berberis aristata*	*Mahonia borealis*
4.	*Parpata*	*Fumaria parviflora*	*Justicia procumbens*
5.	*Saptala*	*Acacia rugata*	*Acacia concina*
6.	*Vasaka*	*Adhatoda vasica*	*Ailanthes excelsa*
7.	*Kumari*	*Aloe vera*	*Acacia catechu*
8.	*Yashtimadhu*	*Glycyrrhiza glabra*	*Abrus precatorius*
9.	*Jatamansi*	*Nardostachys jatamansi*	*Selinum vaginatum*
10.	*Katuki*	*Piccorrhiza kurroa*	*Latotis castimiria*
11.	*Sarpagandha*	*Rauwolfia serpentina*	*Rauwolfia densiflora*
12.	*Khadira*	*Acacia catechu*	*Senecio jacquemontianus*
13.	*Markandika*	*Cassia angustifolia*	*Cassia obtusa*
14.	*Maricha*	*Piper nigrum*	*Schinus molle*
15.	*Langali*	*Gloriosa superba*	*Costus speciosus*

Examples

1. Plant Drugs

(i) *Karpūra*

Latin Name: *Cinnamomum camphora*

Family: Lauraceae

Karpura is very commonly adulterated with gum, resin, alum, starch etc.

Tests for genuinity:

1. Original camphor dilutes very quickly when put in chloroform or solvent Ether, but adulterated may dilute slowly.
2. Original camphor floats.
3. Genuine camphor burns quickly.

ii) *Guggulu*

Latin Name: *Commiphora mukul*

Family: Burseraceae

Guggulu is adulterated with sand, wood pieces, pieces of bark & *Shallaki* exudates. Guggulu is one of the commonest drugs used in Ayurvedic pharmaceutics, so to increase the weight it is adulterated.

Test for genuinity:

1. When put on fire first liquefies then gives white fumes.
2. When small particles put on water, the particles become round.

2. Animal Drugs

(i) Kasturi-Musk

Kasturi has become very rare and demand for musk is high so musk is commonly adulterated. Powder of black earth or starch is mixed with any oil to make a bolus, and then it is externally covered with skin of deer and sold as musk.

Tests for genuinity :

1. 3 days musk should be immersed in water, and then dried, if it possess same odour then it is original musk.
2. It spreads odour even when it is diluted 3000 times of water.
3. If musk comes in contact with garlic and camphor, they lose their odour.

Multiple Choice Questions (MCQ):

1. The substances having similar pharmacological activities as like that of genuine drug but may not have similar appearance
   a. Apamishrana b. Pratinidhi Dravya
   c. Vishesha Dravya d. Agrya Dravya
   Ans: b. Pratinidhi Dravya
2. Substitute for Tagara
   a. Ativisha b. Jatamansi c. Kushtha d. Pippali
   Ans: c. Kushtha
3. Jatipushpa is substituted with
   a. Lavanga b. Puga c. Bhallataka d. Nagakeshara
   Ans: a. Lavanga
4. Pushkaramula is substituted with
   a. Tagara b. Kushta c. Katuki d. Gandira
   Ans: b. Kushtha
5. Gajapippali is substituted with
   a. Maricha b. Chitraka c. Shunthi d. Pippalimula
   Ans: d. Pippalimula
6. Madhuyashti is substituted with
   a. Draksha b. Nirgundi c. Dhataki d. Chitraka
   Ans: c. Dhataki
7. Kashmariphala is substitute for
   a. Kharjura b. Draksha c. Vibhitaki d. Amalaki
   Ans: b. Draksha
8. Shwetachandana is substituted with
   a. Karpura b. Haridra c. Kumkuma d. Raktachandana
   Ans: d. Raktachandana
9. Ativisha is substituted with
   a. Katuki b. Musta c. Vatsanabha d. Shatavari
   Ans; b. Musta
10. Substitute for Meda & Mahameda is
    a. Ashwagandha b. Vidarigandha c. Shatavari d. Varahikanda
    Ans: c. Shatavari

11. Jivaka & Rishabhaka are substituted with
    a. Vidarigandha b. Shatavari c. Varahikanda d. Ashwagandha
    Ans: a. Vidarigandha
12. Kakoli & Kshirakoli are substituted with
    a. Shatavari b. Ashwagandha c. Vidarigandha d. Varahikanda
    Ans: b. Ashwagandha
13. Riddhi & Vraddhi are substituted with
    a. Varahikanda b. Shatavari c. Ashwagandha d. Vidarigandha
    Ans: a. Varahikanda
14. *Rauwolfia serpentina* is substituted with
    a. *Withania somnifera* b. *Plumbago zeylanica*
    c. *Emblica officinalis* d. *Rauwolfia tetraphylla*
    Ans: d. *Rauwolfia tetraphylla*
15. Pratinidhi Dravya for *Daruharidra*
    a. *Terminalia chebula* b. *Coscinium fenestratum*
    c. *Tinospora cordifolia* d. *Curcuma amada*
    Ans: b. *Coscinium fenestratum*

*****

18 Chapter

Classifications and Techniques of Aqueous and Alcoholic Extracts

Contents:

- Definition of extracts
- Solvent
- Types of extracts
- Materials required
- Method of preparation
- Uses

Definition

Extracts are liquid (fluid extracts) or solid dry extracts or of intermediate consistency (soft extracts) preparations obtained from herbal dry raw materials.

Extraction, as the term is used pharmaceutically, involves the separation of medicinally active portions of plant from the inactive or inert components by using selective solvents in standard extraction procedures. The products so obtained from plants are relatively liquids, semisolids or powders intended only for oral or external use. These include classes of preparations known as decoctions, infusions, fluid extracts, tinctures, semisolid extracts and powdered extracts.

To obtain optimum yield by extraction, appropriate raw material, solvent and method should be adopted.

1. **Raw material:** The following aspects must be considered before extraction
   a. Authentication of plant material and the part should be done.
   b. Any foreign matter should be completely eliminated.
   c. Conditions used for drying the plant material should be noted.
   d. Grinding methods should be specified and techniques that generate heat should be avoided as much as possible.
   e. Powdered plant material should be passed through suitable sieves (30-40 mesh size is optimal) to get the required particles of uniform size.
2. **Solvent:** Solvents commonly used in extraction of medicinal plants are polar solvent (e.g., water, alcohols), intermediate polar (e.g., acetone, dichloromethane), and nonpolar (e.g., n-hexane, ether, chloroform). The choice of solvent depends on the type of plant, part of plant to be extracted, nature of the bioactive compounds, and the availability of solvent. Factors to be considered in selecting solvents of extraction

a. Selectivity- The ability of a chosen solvent to extract the active constituent and

leave the inert material. For e.g., water is the most polar solvent and dissolves a wide range of polar compounds.

b. Safety- Ideal solvent of extraction should be nontoxic and nonflammable.

c. Cost- It should be as cheap as possible.

d. Reactivity- Suitable solvent of extraction should not react with the extract.

e. Recovery- Solvent should be quickly recovered and separated from the extract.

f. Viscosity- Should be of low viscosity to allow ease of penetration.

g. Boiling temperature- Should be as low as possible to prevent degradation of plant material by heat

3. **Method of preparation-** The dry herb must be suitably ground to ensure total extraction of the active or characteristic principles in a short time. Extraction must be carried out with an appropriate solvent. Appropriate solvent means a solvent that not only ensures extraction without degradation of the active or characteristic principles but is selective, i.e., dissolves little of the secondary extractive material. The extract may be prepared by maceration, percolation or any other suitable procedure.

1. **Maceration**- For maceration, the powdered drug is taken in a stoppered container with the solvent and allowed to stand for a period of 24 to 48 h with frequent agitation. The mixture is filtered and the marc (drug residue) may be macerated again with fresh solvent.

2. **Percolation**- The powdered drug is allowed to macerate with the specified solvent for a specified period in a percolator after which the stopcock is opened to allow the extract to drip slowly from the bottom. The collected extract is evaporated in a rotary evaporator and the recovered solvent is put back in the percolator. This process is continued until a drop of the solvent from the percolator when evaporated does not leave a residue.

3. **Digestion-** This is a form of maceration in which gentle heat is used during the process of extraction.

4. **Infusion-** This is generally prepared by macerating the powdered drug for a short period of time in cold or boiling water.

5. **Decoction-** In this process the powdered drug is boiled in specified volume of water for defined time, cooled and filtered. This procedure is suitable for extracting water soluble and heat stable constituents.

6. **Hot continuous extraction (using Soxhlet)** - In this method, finely powdered drug held in a porous bag or a 'thimble' made of strong filter paper is placed

in the sample chamber of the Soxhlet. The suitable solvent is taken in a round bottomed flask and the apparatus is assembled. When the mixture of the drug and the solvent is heated in a heating mantle, its vapors get condensed in the condenser and drip on to the thimble containing the crude drug, extracting it by contact. When the level of the liquid in the sample chamber rises to the top of the siphon tube, the liquid siphons into the flask. This process is continuous and is done until a drop of the solvent from the siphon tube when evaporated doesn't leave a residue. Collect the extract, remove the solvent under vacuum to obtain the extract.

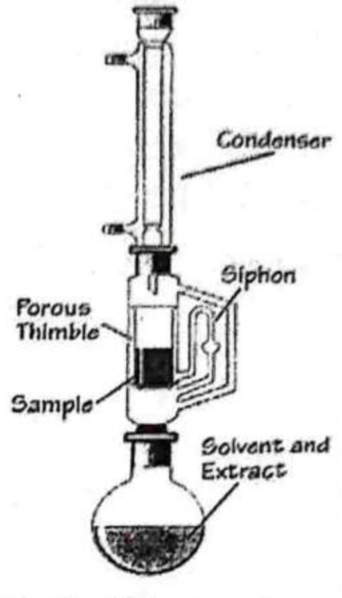


Fig. Soxhlet apparatus

Other methods of extraction are:

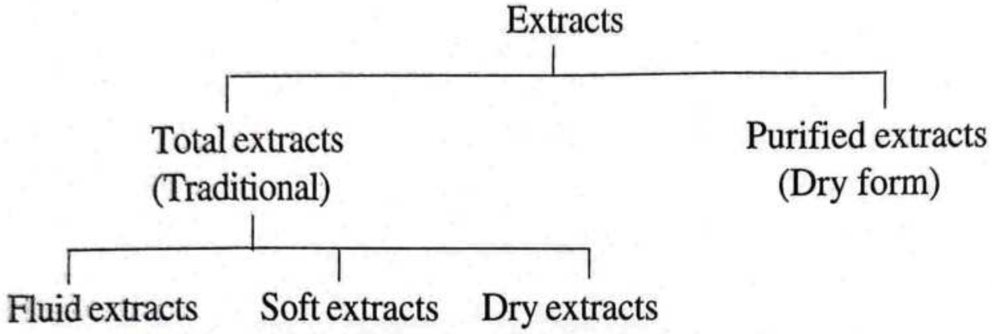
Counter-current Extraction (CCE)- In CCE, wet raw material is pulverized using toothed disc disintegrators to produce a fine slurry. In this process, the material to be extracted is moved in one direction (generally in the form of a fine slurry) within a cylindrical extractor where it comes in contact with extraction solvent. Further the material moves, the more concentrated the extract becomes. Complete extraction is thus possible when the quantities of solvent and material and their flow rates are optimized. The process is highly efficient, requiring little time and posing no risk from high temperature. Finally, sufficiently concentrated extract comes out at one end of the extractor while the marc (practically free of visible solvent) falls out from the other end.

Ultrasound Extraction (Sonication) - The procedure involves the use of ultrasound with frequencies ranging from 20 kHz to 2000 kHz; this increases the permeability of cell walls and produces cavitation. Although the process is useful in some cases, its large-scale application is limited due to the higher costs. One disadvantage of the procedure is the occasional but known deleterious effect of ultrasound energy (more than 20 kHz) on the active constituents of medicinal plants through formation of free radicals and consequently undesirable changes in the drug molecules.

Supercritical Fluid Extraction (SFE)- uses CO_2 as the extracting fluid instead of organic solvents. In recent years, Argon is also used for extraction. The largest area of growth in the development of SFE has been the rapid expansion of its applications. SFE finds extensive application in the extraction of pesticides, environmental samples, foods and fragrances, essential oils, polymers and natural products. The major deterrent in the commercial application of the extraction process is its prohibitive capital investment.

Phytonics Process- In this, new generation of fluorocarbon solvents have been applied to the extraction of plant materials. The core of the solvent is 1,1,2,2-tetrafluoroethane, better known as hydrofluorocarbon-134a (HFC-134a). This patented technology, developed by Advanced Phytonics Limited (Manchester, UK) is mostly used to extract fragrant components of essential oils and biological or phytopharmacological extracts.

Types of extracts



1. Total extracts: The term "total" or 'traditional extracts' denote extracts that contain all the extractive matter obtained by treating the drug with a solvent, as a rule aqueous or hydroalcoholic. Total extracts often contain substances such as saponins and polyphenols that are regarded as inert but that may be crucial to the absorption of the active principles.

Traditional extracts may be divided into:

a. Fluid extracts b. Soft extracts c. Dry extracts

2. Purified extracts: The term 'purified' means preparations from which substances considered useless if not actually detrimental to the activity of the extract have been removed. A purified extract may be obtained by extracting the drug with a specific solvent and/or by removing the inert substances by various methods (defatting and passing over absorption resins) after the primary extraction. The term "inert substances" applies chiefly to resins, fat and sugars and all materials that constitute a major hindrance in the preparation of pharmaceutical forms. Purified extracts as a rule are in dry state. They have an identity and validity of their own because they are natural mixtures of chemically related substances, all endowed with the same or similar pharmacological activity.

Example- of purified extract- extracts of Senna with 45-60% content of Sennosides.

Uses

1. For drug evaluation

a. Extractive values- The determination of extractable matter with a solvent refers to the quantity of constituents in a given amount of medicinal plant material. Such extractive values prove an indication of the extent of polar, medium polar and non-polar component present in the drug.

b. Phytochemical evaluation- Preliminary phytochemical investigations to detect phytoconstituents present in the extract.
c. To prepare pharmaceutical formulations
d. To evaluate the constituent responsible for an activity
e. For experimental evaluation on animals.

Experiment

Aim: To prepare Aqueous extract of the given plant sample

Requirements

- Plant specimen
- Weighing scale
- Stoppered Conical flask
- Funnel
- Filter paper
- Container
- Dessicator
- Solvent- water 100ml
- Measuring cylinder
- Tripod stand
- Beaker
- Drying dish
- Hot air oven

Method

1. Weight 5g (W) of the powdered plant sample and transfer it to a conical flask
2. Measure 100ml water and transfer to the conical flask containing sample.
3. Macerate the sample with water by shaking frequently during six hours and allowing to stand for eighteen hours.
4. Filter rapidly through a filter paper, taking precautions against loss of solvent.
5. Evaporate the filtrate to dryness in a pre-weighed drying dish. (W_1)
6. Dry the dish in hot air oven at 105°C, to constant weigh and note down the weight of the dish. (W_2)
7. The difference in the weight of the dish gives the quantity of extract obtained.

Calculation

Quantity of extract = W_2-W_1

Percentage of extract= W_2-W_1/W x100

Inference

The quantity (and %) of water extract obtained for the given sample is _____

References

Dekebo A. Introductory Chapter: Plant Extracts [Internet]. Plant Extracts. IntechOpen;

2019. Available from: <http://dx.doi.org/10.5772/intechopen.85493>

Sukhdev Swami Handa, Suman Preet Singh Khanuja, Gennaro Longo, Dev Dutt Rakesh. Extraction technologies for medicinal and aromatic plants. International centre for science and high technology. 2008;32

Abubakar AR, Haque M. Preparation of Medicinal Plants: Basic Extraction and Fractionation Procedures for Experimental Purposes. J Pharm Bioallied Sci. 2020 Jan-Mar[Accessed 1 Sep 2023];12(1):1-10. doi: 10.4103/jpbs.JPBS_175_19.

Anonymous. The Ayurvedic Pharmacopeia of India. 1st ed. New Delhi: Ministry of Health & Family Welfare, Department of AYUSH, Government of India; 2001. (1; vol. 3).

Multiple Choice Questions (MCQ)

1. Soxhlet apparatus is used for preparation of

   a. Extracts b. Powder c. Ghee d. Decoction

   Ans: a. Extracts

2. Not the type of extracts

   a. Fluid extracts b. Soft extracts c. Dry extracts d. Wet extracts

   Ans: d. Wet extracts

3. Percolation is a type of

   a. Ghee preparation b. Churna c. Tablets d. Extracts

   Ans: d. Extracts

4. Ultrasound Extraction is also known as

   a. Sublimation b. Sonication c. Subtraction d. Multiplication

   Ans: b. Sonication

*****

19 Chapter

Adverse drug reaction and Pharmacovigilance with recent updates

Content

- Adverse drug reaction with recent updates
- Pharmacovigilance
- Origin of Pharmacovigilance monitoring
- Evolution of Pharmacovigilance Programme of India (PvPI)
- Pharmacovigilance programme for Ayurveda, Siddha & Unani (ASU) drugs
- Hierarchy of Pharmacovigilance Program
- Reporting ADR
- *Dravyanam Vairodhika Vichara*
- Types of *Viruddha*
- Diseases due to *Viruddhahara Sevana*

Adverse drug reaction and Pharmacovigilance with recent updates

Adverse Drug Reaction (ADR) or adverse drug effects is defined as any response to a medicine that is noxious and unintended and which occurs at doses normally used in man.

Adverse drug reactions may be classified as :

Type A (pharmacological): These reactions are predictable as they are based on pharmacological profile of the drug. These are dose related and most common. The severity of reactions is variable but usually mild. These include side effects, toxic effects, secondary effects, drug interactions.

Type B (hypersensitivity): These reactions are unpredictable as they are based on the peculiarities of patient. These are uncommon in occurrence. The severity of reactions are variable but more severe. These include drug allergy & idiosyncrasy.

1. Side effects: These are unwanted but often unavoidable pharmacodynamics effects that occur at therapeutic doses. Generally, they are not serious, can be predicted from the pharmacological profile of the drug and are known to occur in a given percentage of drug recipients. Reduction in dose, usually reduces the symptoms.

Eg: Atropine is used as a pre-anesthetic medication for its anti- secretory action, the same action produced dryness of mouth as a side effect.

2. Secondary effects: These are indirect consequences of a primary action of the drug.

Eg: Suppression of bacterial flora by Tetracyclines paves way for superinfections.

3. Toxic effects: These are the result of excessive pharmacological action of the drug due to overdose or prolonged use.

Eg: bleeding due to anticoagulants, hepatic necrosis from paracetamol over dosage.

4. Hypersensitivity (drug allergy): it is an immunologically mediated reaction producing stereotype symptoms which are unrelated to the pharmacodynamics profile of the drug, generally occur even with smaller doses and have a different time course of onset & duration. This is also called drug hypersensitivity.

5. Idiosyncrasy: It is a genetically determined abnormal reactivity to a chemical. The drug interacts with some unique feature of the individual, not found in majority of subjects, and produces the uncharacteristic reaction. As such, the type of reaction is restricted to individuals with a particular genotype.

6. Drug dependence: Drugs capable of altering mood & feelings are liable to repetitive use to derive euphoria, recreation, withdrawal from reality, social adjustment etc. Drug dependence is a state in which use of drugs for personal satisfaction is accorded a higher priority than other basic needs, often in the face of known risks to health.

7. Drug withdrawal reactions: Sudden interruption of therapy with certain drugs also results in adverse consequences, mostly in the form of worsening of the clinical condition for which the drug was being used, like in the example; frequency of seizures may increase on sudden withdrawal of an epileptic.

Pharmacovigilance

Pharmacovigilance has been defined by the WHO (2002) as the 'science and activities relating to the detection, assessment, understanding and prevention of adverse effects or any other drug related problems. Its main purpose is to reduce the risk of drug related harm to the patient. It has an important role in the rational use of medicines as it provides the basis for assessing safety of medicines.

The activities involved in pharmacovigilance are:

a. Post marketing surveillance and other methods of ADR monitoring such as voluntary reporting by doctors, computerized medical record linkage, and cohort/case control studies.

b. Dissemination of ADR data through drug alerts, medical letters, advisories by pharmaceuticals & regulatory agencies

c. Changes in the labelling of medicines indicating restrictions in use or statuary warnings, precautions or even withdrawal.

Origin of Pharmacovigilance monitoring

- 1961- Tragedy of Thalidomide, occurrence of congenital malformations of babies due to thalidomide consumption during pregnancy.
- In 1968, the WHO Programme for International Drug Monitoring was instituted to monitor and disseminate ADR across the world.
- In 1971, International database was constituted in WHO, Geneva
- **Vigibase** - is the unique WHO global database of individual case safety reports (ICSRs). It is the largest database of its kind in the world, with over 30 million reports of suspected adverse effects of medicines, submitted, since 1968, by 150 member countries of the WHO Programme for International Drug Monitoring. It is continuously updated with incoming reports.3
- In 1978, Uppsala Monitoring Center was established as World Health Organization (WHO) Collaborating Center for International Drug Monitoring. UMC is an independent, non-profit foundation and a center for international service and scientific research. UMC operates the technical and scientific aspects of the WHO's worldwide pharmacovigilance network.2

Uppsala Monitoring Center

Evolution of Pharmacovigilance Programme of India (PvPI)

- In early 1980, attempts were made in India towards ADR monitoring. The Drug Controller General of India (DCGI) established five centers in 1982 for nationwide monitoring of ADR.
- In 1998, India joined WHO International Drug Monitoring Programme.
- In 2004, with the assistance of World Bank Central Drugs Standard Control Organization (CDSCO), New Delhi under the aegis of Ministry of health & family welfare, Govt of India, introduced the national pharmacovigilance program (NPP).[1]
- In 2010, CDSCO initiated a nation-wide pharmacovigilance programme of India (PvPI), with All India Institute of Medical Sciences (AIIMS), New Delhi as the National Coordinating Centre (NCC) for monitoring Adverse Drug Reactions (ADR) in the country.
- In 2011, to ensure implementation of this programme in a more effective way, the NCC was shifted from AIIMS, New Delhi to the Indian Pharmacopoeia Commission (IPC), Ghaziabad, (U.P.)

- IPC, NCC-PvPI became a WHO Collaborating Centre for Pharmacovigilance in Public Health Programmes & Regulatory services from July 2017.

Mission

The mission of PvPI is to safeguard the health of the Indian population by ensuring that the benefit of use of medicine outweighs the risks associated with its use. The broadened patient safety scope of pharmacovigilance includes the detection of medicines of sub-standard quality as well as prescribing, dispensing and administration errors. Counterfeiting, antimicrobial resistance, and the need for real time surveillance in mass vaccinations are other pharmacovigilance challenges which are addressed.

IPC, NCC-PvPI

Function

NCC, PvPI collects, collates and evaluates spontaneous reports of ADRs due to use of medicines, vaccines, medical devices and herbal products from all healthcare professionals and consumers/patients. Currently, there are 250 ADR monitoring centres across the country who report to NCC-PvPI located at Ghaziabad. The inferences drawn from analyses are used to recommend informed regulatory interventions besides communicating risks to healthcare professionals and the public.

Reporting ADR

Suspected ADR may be reported by health professionals/ patients/ consumers/ pharmacy through ADR reporting form directly to centres or via mobile app or toll-free number.

Pharmacovigilance programme for Ayurveda, Siddha & Unani (ASU) drugs

- 2006- A workshop was organised in collaboration with WHO, on, "Pharmacovigilance of Ayurvedic Medicine"
- October 2007- a seminar-cum workshop entitled "Safety Profile of Ayurvedic Dosage Forms" was organised at BHU's Institute of Medical Sciences' Department of Rasa Shastra. This seminar's technical report submitted to WHO strongly influenced the implementation of pharmacovigilance for ASU medicines.
- December, 2007- Organized a workshop on the possibility of implementing pharmacovigilance programs for Ayurvedic medicine at Institute of Post Graduate Teaching and Research in Ayurveda (IPGTRA), at Gujarat Ayurveda University, Jamnagar.
- 2008- IPGTRA prepared a protocol and ADR reporting format to implement

pharmacovigilance for Ayurveda, Siddha, and Unani (ASU) drugs. Department of AYUSH released the draft and IPGTRA was declared National Pharmacovigilance Resource Centre for ASU Drugs.

- 2017-18- A nationwide program was launched under central sector scheme funded by Ministry of AYUSH, New Delhi. The program is coordinated by NPvCC under the supervision of Ministry of AYUSH, New Delhi that would monitor the program and also recommend regulatory interventions based on the generated Adverse Drug Reaction (ADR) data and objectionable advertisements.

Objectives

- To collect, collate and analyze data to establish evidence for clinical safety of ASU & H drugs
- To undertake surveillance of misleading advertisements of these drugs.

Hierarchy of Pharmacovigilance Program

To achieve the objectives of the program, the following structure is established

- National Pharmacovigilance Co-ordination Centre (NPvCC)- All India Institute of Ayurveda, New Delhi is the NPvCC. The co-ordinating centre in consultation with the Pharmacopoeial Commission of Indian Medicine and Homoeopathy (PCIM&H), if required, shall conduct the Causality Assessment of the signals received from the Intermediary Pharmacovigilance Centres (IPvCs) and intimate to the Ministry of AYUSH regarding confirmed ADRs and misleading advertisements to enable suitable action.
- Intermediary Pharmacovigilance Centres (IPvCs)- are 5 in number
- Peripheral Pharmacovigilance Centres (PPvCs)- are 63 in number

Reporting ADR

Suspected ADR may be reported by health professionals/ patients/ consumers/ pharmacy through ADR reporting form directly to centres or via toll-free number or on the website- *ayushsuraksha* (https://www.ayushsuraksha.com/)

Ayushsuraksha

References

1. I Ralph Edwards, Jeffrey K Aronson. Adverse drug reactions: definitions, diagnosis, and management. Lancet 2000; 356: 1255-59. [accessed 25 August 2023] Available from: https://www.thelancet.com/journals/lancet/article/PIIS0140673600027999/fulltext. https://doi.org/10.1016/S0140-6736(00)02799-9
2. Fornasier G, Francescon S, Leone R, Baldo P. An historical overview over

Pharmacovigilance. Int J Clin Pharm. 2018 Aug;40(4):744-747. doi: 10.1007/s11096-018-0657-1.

3. Uppsala Monotoring centre(UMC)[accessed on 25 Aug 2023] https://who-umc.org/about-uppsala-monitoring-centre/
4. Pharmacovigilance programme of India (PvPI) [accessed on 25 Aug 2023] https://www.ipc.gov.in/PvPI/pv_home.html
5. Ayushsuraksha. [Accessed on 26 Aug 2023]https://www.ayushsuraksha.com/

Dravyanam Vairodhika Vichara

यत्किञ्चित् दोषमास्त्रव्य न निर्हरति कायतः । आहारजातं तत् सर्वमहितोपपद्यते ॥ च.सू. 26/85

अनुक्त वैरोधिकसंग्रहार्थमाह-यत् किञ्चिदित्यादि । आह्रियत इत्याहारो भेषजमपि । दोषमास्त्रव्येति दोषानुत्क्लिष्टरुपान् जनयित्वा न निर्हरतीति । अनेन वमनविरेचन द्रव्याणि निराकरोति, तानि हि दोषानास्त्राव्य निर्हरन्ति ॥ चक्रपाणि दह च.सू. 27/85

Food substances which dislodge the *Doshas* but do not expel them out of the body are known as *Viruddha* or *Ahita dravyas* (Incompatibility).

यत्किञ्चिद्दोषमुत्क्लेश्य न हरेत्तत्समासतः ॥ विरुद्धम्............................... अ.हृ.सू. 7/45

यत्किञ्चित् अन्नपानमौषधं वा, दोषमुत्क्लेश्य स्वस्थानात्सञ्चल्य, न हरेत् बहिर्न निष्कासयेत्, तत् समासतः संक्षेपतो विरुद्धम् । अरुणदत्त on अ.हृ.सू. 7/45

अनुक्त विरोध संङ्ग्रहार्थं विरोध सामान्य लक्षणमाह-यत्किञ्चिदिति । यत्किञ्चिद्द्रव्यं दोषमुत्क्लेशयति न तु निर्हरति, तत्सर्वं विरुद्धम्, समासतः संक्षेपात् । विस्तरस्तु संयोगादि भेदैरनन्तः । शोधनमप्युत्क्लेशयति परं निर्हरति, शमनमपि न निर्हरति परं नोत्क्लेशयति, इति न तयोर्विरुद्धत्वम् ।
हेमाद्रि on अ.हृ.सू. 7/45

Food, liquids or medicines which aggravate *Doshas* but won't expel is known as *Viruddha.*

Aruṇadatta and *Hemadri*, commentators of *Ashtanga Hradaya* opines in a similar way and also clarified that why *Shodhana* and *Shamana* dravyas are not *Viruddha dravyas. Shodhana dravyas* even though cause aggravation of *Doshas* but they expel out of the body, hence *Shodhana dravyas* are not incompatible. When it comes to *Shamana dravyas,* they do not cause any aggravation of *Doshas* hence they are not *Viruddha.*

यत्किञ्चिद्दोषमुत्क्लेश्य युक्तं कायान्न निर्हरेत् । रसादिष्वयथार्थं वा तद्विकाराय कल्पते ॥
(सु.सू. 20/20)

The food or medicine which when consumed won't nourish *Rasadi Dhatus* and in turn aggravate *doshas* and not expelled are *Viruddha*.

Types of *Viruddha*:

यच्चापि देशकालाग्निमात्रा सात्म्यानिलादिभिः । संस्कारतो वीर्यतश्च कोष्ठावस्थाक्रमैरपि ॥
परिहारोपचाराभ्यां पाकात् संयोगतो ऽपि च । विरुद्धं तच्च न हितं हृत्संपद्विधिभिश्च यत् ॥
च.सू. 27/86-87

Charaka has mentioned 18 types of *Viruddha.*

1. *Desha Viruddha*	2. *Kala Viruddha*
3. *Agni Viruddha*	4. *Matra Viruddha*
5. *Satmya Viruddha*	6. *Dosha Viruddha*
7. *Samskara Viruddha*	8. *Virya Viruddha*
9. *Koshtha Viruddha*	10. *Avastha Viruddha*
11. *Krama Viruddha*	12. *Parihara Viruddha*
13. *Upachara Viruddha*	14. *Paka Viruddha*
15. *Samyoga Viruddha*	16. *Hrat Viruddha*
17. *Sampat Viruddha*	18. *Vidhi Viruddha*

Charaka has explained 18 types of *Viruddha* with examples.

1. *Desha Viruddha*

विरुद्धं देशतस्तावद्रूक्षतीक्ष्णादि धन्वनि । आनूपे स्निग्धशीतादि भेषजं यन्निषेव्यते ॥
च.सू. 26/88

If a person does not follow the dietetic rules and regulation as per the region then it becomes *Desha Viruddha.*

E.g.: (i) Intake of *Ruksha* (Dry) & *Tikshna* (sharp) substances in *Jangala* (Dry) region is *Viruddha* (incompatible).

(ii) Intake of *Snigdha* (Unctuous) & *Shita* (Cold) substances in *ĀAnupa* (Marshall) region becomes *Viruddha* (incompatible).

2. *Kala Viruddha*

कालतोऽपि विरुद्धं यच्छीतरुक्षादि सेवनम् । शीतेकाले, तथोष्णे च कटुकोष्णादि सेवनम् ॥
च. सू. 26/89

Depending on time one has to take proper food otherwise it will become *Viruddha.*

E.g.: Consuming *Shita* (Cold) & *Ruksha* (Dry) food in *Shitakala* (winter) becomes *Viruddha.*

Intake of *Katu* (Pungent) & *Ushna* (Hot) *Dravya* in *Ushna Kala* (summer) becomes *Viruddha.*

3. *Agni Viruddha*

विरुद्धमनले तद्वदन्नपानं चतुर्विधे । च.सू. 26/90

After assessing *Agnibala* one has to consume food accordingly. So, 4 types of food may be consumed as per the strength of *Agni.*

E.g.: In *Mandagni* - Light food should be taken otherwise it becomes *Viruddha.*

4. *Matra Viruddha*

मधुसर्पिः समघृतं मात्रया तद्विरुध्यते । च.सू. 26/90

Some substances if taken in equal amount may cause harmful effects on body.

E.g.: Honey and *Ghrata* in equal amount may be harmful.

5. *Satmya Viruddha*

कटुकोष्णादि सात्म्यस्य स्वादुशीतादि सेवनम् । यत्रत् सात्म्य विरुद्धं............... ॥ च.सू. 26/91

If a person habituated for one substance then opposite quality in substance which he is going to consume becomes *Viruddha.*

E.g.: Person who is habituated for pungent and hot substances if consumes sweet and cold substance then it becomes *Viruddha* to him.

6. *Dosha Viruddha*

.... विरुद्धं त्वनिलादिभिः । या समानगुणाभ्यासविरुद्धान्नौषधक्रिया ॥ च.सू. 26/91-92

Using similar qualities which vitiate *Doshas* will aggravate the condition. Hence it is *Viruddha.*

7. *Samskara*

संस्कारतो विरुद्धं तद्यद्भोज्यं विषवद्भवेत् । रारण्डसीसकासक्तं शिखि मांसं यथैव हि ॥
च.सू. 26/92-93

If proper processing not followed while preparing any medicine or article then it causes harmful effects.

E.g.: Peacock meat cooked with castor wood becomes *Ahita.*

8. *Virya Viruddha*

विरुद्धं वीर्यतो ज्ञेयं वीर्यतः शीतलात्मकम् । तत् संयोज्योष्ण वीर्येण द्रव्येण सह सेव्यते ॥
च.सू. 26/93-94

Combination of two substances having opposite *Virya* (Potency) becomes *Viruddha.*

E.g.: *Shita Virya* (Cold Potency) if combined with *Ushna Virya* (Hot potency) becomes *Viruddha.*

9. *Koshtha Viruddha*

क्रूरकोष्टस्य चात्यल्पं मन्दवीर्यमभेदनम् ॥ मृदुकोष्ठस्य गुरु च भेदनीयं तथा बहु ।
रातत् कोष्ठ विरुद्धं तु............... ॥ च.सू. 26/94-95

If medicines not consumed as per the *Koshtha* (Nature of stomach) then it becomes *Viruddha.*

E.g.: A mild purgative in *Krurakoshtha* patient won't cause purgation or in case of *Mradu Koshtha* patient of strong purgative is administered will cause severe purgation.

10. *Avastha Viruddha*

....................विरुद्धं स्यादवस्थया ॥ श्रमव्यवायव्यायामसक्त स्यानिलकोपनम् ।
निद्रालसस्य भोजनं श्लेष्मकोपनम् ॥ च.सू. 26/95-96

Food consumed without assessing condition of the person may become *Viruddha.*

E.g.: When a person exhausted due to hard work, intercourse and exercise consumes food which aggravates *Vata* and when a person sleeps after consuming *Kaphavardhaka Ahara* further aggravates *Dosha.*

11. *Krama Viruddha*

यच्चात्नुसृज्य विण्मूत्रं भुङ्क्ते यश्चाबुभुक्षितः । तच्चक्रमविरुद्धं स्याद्यच्यातिक्षुद्वशानुगः ॥
च.सू. 26/97

The Person, if he does not follow an order may have bad effects from food.

E.g.: When person consumes food before he passes urine and bowel or when he is not hungry or when he has severe hunger becomes *Viruddha.*

12. *Parihara Viruddha*

परिहार विरुद्धं तु वराहादीन्निषेव्य यत् । सेवेतोष्णं...........................॥ च.सू. 26/98

Intake of *Ushna dravyas* after consuming pork etc is a *Viruddha*.

13. *Upachara Viruddha*

..............घृतादींश्च पीत्वा शीतं निषेवते ॥ च.सू. 26/98

Taking *Shita* (Cold) *Dravyas* after the intake of *Ghrata* (Ghee).

14. *Paka Viruddha*

विरुद्धं पाकतश्चापि दुष्टदुर्दारुसाधितम् । अपक्व तण्डुलात्यर्थ पक्वदग्धं च यद्भवेत् ॥
च.सू. 26/99

If proper method is not followed while cooking then it becomes *Viruddha.*

Eg: Cooking the food material with rotten fuel or wood of poisonous plants becomes *Viruddha.*

15. ***Samyoga Viruddha***

संयोगतो विरुद्धं तद्यथाऽम्लं पयसा सह । च.सू. 26/99

Combining two different *Rasa* like *Amla* & *Madhura* becomes *Viruddha.*

E.g.: Milk mixed with *Amla dravya.*

16. ***Hrat Viruddha***

अमनोरुचितं यच्च हृद्विरुद्धं तदुच्यते ॥ च.सू. 26/100

Substance which is not pleasant to mind is considered as *Hrat Viruddha.*

E.g.: The *dravya* which is not palatable is *Hrat Viruddha.*

17. ***Sampat Viruddha***

संपद्विरुद्धं तद्विद्यादसंजातरसं तु यत् । अतिक्रान्त रसं वाऽपि विपन्नरसमेव वा ॥ च.सू. 26/101

Consuming the substance which is immature, over mature or rotten becomes *Viruddha.*

18. ***Vidhi Viruddha***

ज्ञेयं विधिविरुद्धं तु भुज्यते निभृते न यत् । तदेवं विधमन्नं स्याद्विरुद्धमुपयोजितम् ॥ च.सू. 26/101

While taking food certain rules to be followed otherwise it becomes *Viruddha.*

E.g.: Taking meals in public is *Viruddha.*

In *Hitahitadhyaya* of *Sutrasthana* in *Sushruta Samhita, Acharya Sushruta* has mentioned various types of *Viruddha dravyas.* In this chapter many *Ahitas* are mentioned which may be considered as *Viruddha.*

(i) ***Karma Viruddha-*** Here *Karma* refers to *Samskara* (Procedure).

रारण्ड तैल सिद्धा वा नाद्यात् ॥ सु. सू. 20/14

Any food cooked with *Eranda Kashtha* becomes *Viruddha.*

(ii) ***Mana Viruddha-*** Quantity of two substances is considered.

मधुसर्पि मानतस्तुल्ये नाश्नीयात्; । सु.सू. 20/15

Madhu (Honey) & *Ghrata* (Ghee) should not be taken in equal quantity.

(iii) ***Rasa Viruddha-*** Two substances having different/opposite *Rasas* should not be mixed.

तत्र मधुराम्लौ रसवीर्य विरुद्धौ । सु.सू. 20/16

Madhura Rasa and *Amla Rasa* become *Rasa Viruddha* and also *Virya Viruddha.*

(iv) *Vipaka Viruddha*

अम्लकटुकौ रसविपाकाभ्याम् । सु.सू. 20/16

Combination of *Dravyas* undergoing *Amla Vipaka* and *Kaṭu Vipaka* becomes *Ahita.*

(v) *Virya Viruddha*

कटुतिक्तौ रसवीर्याभ्यां । सु.सू. 20/16

Dravyas have *Katu Rasa* will have *Ushna Virya* and *Tikta Rasa* will have *Shita Virya.* Combination of these two *Dravyas* becomes *Viruddha.*

Diseases due to *Viruddhahara Sevana*

षाण्ढ्यान्ध्यवीसर्पदकोदराणां विस्फोटकोन्माद भगन्दराणाम् । मूर्छामदाध्मानगलग्रहणां पाण्ड्वामयस्यामविषस्य चैव ॥ किलासकुष्ठग्रहणीगदानां शोथाम्लपित्त ज्वरपीनसानाम् । सन्तानदोषस्य तथैव मृत्योर्विरुद्धमन्नं प्रवदन्ति हेतुम् ॥ च.सू. 26/102-103

If a person indulges in such food habbits which are *Viruddha* continuously he will suffer from *Shandhya* (Sterility), *Andhata* (Blindness), *Visarpa* (Herpis), *Dakodara* (Ascites), *Visphota* (Eruptions), *Unmada* (Insanity), *Bhagandara* (Fistula in ano), *Murcha* (Fainting), *Mada* (Intoxication), *Adhmana* (Distension of abdomen), *Galagraha* (Obstruction in throat), *Pandu* (Anemia), *Amavisha* (Toxicity), *Kilasa* (Vitiligo), *Kushtha* (Skin diseases), *Grahani* (Sprue), *Shotha* (Swelling), *Amlapitta* (Sour belching), *Jwara* (Fever), *Pinasa* (Rhinorrhoea), *Santana dosha* (Anamolies in foetus) and *Mratyu* (Death).

व्याधिमिन्द्रिय दौर्बल्यं मरणं चाधिगच्छति । विरुद्धरसवीर्याणि भुञ्जानोऽनात्मवान्नरः ॥

सु.सू. 20/19

If one consumes *Viruddha dravyas* it cause various disease, *Indriya dourbalya* (Weakness of sense organs) or *Marana* (Death).

सात्म्यतोऽल्पतया वाऽपि दीप्ताग्नेस्तरुणस्य च । स्निग्धव्यायाम बलिनां विरुद्धं वितथं भवेत् ॥

सु.सू. 20/22 / च.सू. 26/105

Both *Charaka* and *Sushruta* have mentioned some exceptions that if they indulge in *Viruddhahara* then also they may not be harmed.

(i) *Satmya*	-	If person is habituated
(ii) *Alpata*	-	If the quantity is less
(iii) *Diptagni*	-	If appetite is strong
(iv) *Taruna*	-	If person is young
(v) *Snigdha*	-	If person does oleation
(vi) *Vyayama*	-	If person does exercise
(vii) *Balina*	-	If person is naturally strong.

Multiple Choice Questions (MCQ)

1. Any response to a medicine that is noxious and unintended and which occurs at doses normally used in man is known as :
   a. Adverse Drug Reactions
   b. Opposite Drug Reactions
   c. Aversion Drug Reactions
   d. Anti Drug Reactions
   Ans: a. Adverse Drug Reactions
2. Unwanted but often unavoidable pharmacodynamics effects that occur at therapeutic doses
   a. Secondary Effects
   b. Side Effects
   c. Toxicity Effects
   d. Hypersensitivity
   Ans: b. Side Effects
3. Indirect consequences of a primary action of the drug is known as
   a. Side Effects
   b. Hypersensitivity
   c. Secondary Effects
   d. Idiosyncrasy
   Ans: c. Secondary Effects
4. An immunologically mediated reaction producing stereotype symptoms which are unrelated to the pharmacodynamics profile of the drug
   a. Hypersensitivity
   b. Secondary Effects
   c. Idiosyncrasy
   d. Side Effects
   Ans: a. Hypersensitivity
5. The 'science and activities relating to the detection, assessment, understanding and prevention of adverse effects or any other drug related problems is known as
   a. Pharmacotherapeutics
   b. Pharmacovigilance
   c. Pharmaceutics
   d. Pharmacodynamics
   Ans: b. Pharmacovigilance
6. An unique database Vigibase related to
   a. Pharmaceutics
   b. Pharmacotherapeutics
   c. Pharmacovigilance
   d. Pharmacodynamics
   Ans: c. Pharmacovigilance
7. National Pharmacovigilance Co-ordination Centre (NPvCC) is
   a. All India Institute of Ayurveda, New Delhi
   b. National Institute of Ayurveda, Jaipur
   c. Banaras Hindu University, Varanasi
   d. Government Ayurveda College, Bangalore
   Ans: a. All India Institute of Ayurveda, New Delhi

8. The website related to reporting ADR
   a. Ayurvin b. Ayushsuraksha
   c. Ayurviruddha d. Ayurhita
   Ans: b. Ayushsuraksha
9. Intermediary Pharmacovigilance Centres (IPvCs) are —— in number
   a. 9 b. 10
   c. 8 d. 5
   Ans: d. 5
10. Number of Peripheral Pharmacovigilance Centres (PPvCs) are
   a. 25 b. 63
   c. 75 d. 50
   Ans: b. 63

*****

20 Chapter

NMPB (National Medicinal Plant Board), CCRAS (Central Council of Research in Ayurveda Sciences), API (Ayurvedic Pharmacopeia of India), GCTM (Global Centre for Traditional Medicine), PCIMH (Pharmacopeia Commission of Indian Medicine and Homeopathy)

Content

- NMPB (National Medicinal Plant Board)
- Objectives of NMPB
- Schemes of NMPB
- Publications of NMPB
- CCRAS (Central Council of Research in Ayurveda Sciences)
- Research outcomes
- API (Ayurvedic Pharmacopeia of India)
- Need for establishing Pharmacopeia for Ayurveda drugs
- API Publications and Volumes
- GCTM (Global Centre for Traditional Medicine)
- Purpose of Global Centre for Traditional Medicine
- Focus of Global Centre for Traditional Medicine
- PCIMH (Pharmacopeia Commission of Indian Medicine and Homeopathy)
- Objectives of PCIM&H (Homeopathy)

National Medicinal Plants Board (NMPB)

Government of India set up National Medicinal Plants Board (NMPB) on 24th November 2000 with an intention to promote medicinal plants sector. The main focus of NMPB is to implement support policies for conservation, cultivation, trade and export of medicinal plants. The present Chief Executive Officer (CEO) of NMPB is Prof. (Dr.) Tanuja Nesari.

Currently the board is located in Ministry of AYUSH (Ayurveda, Yoga & Naturopathy, Unani, Siddha & Homoeopathy), Government of India. The primary mandate of NMPB is to develop an appropriate mechanism for coordination between various minis-

tries/ departments/ organizations in India and implement support policies/programs for overall (conservation, cultivation, trade and export) growth of medicinal plants sector both at the Central /State and International level.

Objectives of NMPB

- In-situ & ex-situ conservation and augmenting local medicinal plants and aromatic species of medical significance.
- Promote research & development
- Capacity building through trainings, raising awareness through promotional activities like creation of Home/School herbal gardens.
- Development of Good Agricultural and Collection Practices (GACPs)
- Development of agro-techniques
- Mechanism for certification of quality of raw drugs, seeds and planting material.

Schemes of NMPB

- With the aforesaid objectives, NMPB has put forth a Central Sector Scheme for conservation, development and sustainable management of medicinal Plants. This scheme encourages cultivation, conservation, research and awareness programmes on medicinal plants
- NMPB in collaboration with the Quality Council of India (QCI) has also launched a Voluntary Certification Scheme for Medicinal Plant Produce (VCSMPP) to encourage Good Agricultural Practices (GAP) and Good Field Collection Practices (GFCP) in medicinal plants.

Publications of NMPB

1. Good agricultural practices
2. Good field collection practices
3. Agro-techniques of medicinal plants

Central Council of Research in Ayurveda Sciences (CCRAS)

The Central Council for Research in Ayurvedic Sciences (CCRAS) is an autonomous body of the Ministry of AYUSH (Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homeopathy), Government of India. It is an apex body in India for undertaking, coordinating, formulating, developing and promoting research on scientific lines in Ayurveda and Sowa-Rigpa.

The central headquarters of CCRAS is located at New Delhi. The activities are

carried out through its 30 Institutes/Centres/Units located all over India and also through collaborative studies with various Universities, Hospitals and Institutes.

A few peripheral institutes under CCRAS are :

1. National Institute of Indian Medical Heritage, Hyderabad, Telangana
2. Captain Srinivasa Murthy Central Ayurveda Research Institute, Chennai, Tamilnadu
3. Regional Ayurveda Research Centre, Dimapur, Nagaland
4. Central Ayurveda Research Institute, Patiala, Punjab
5. Central Ayurveda Research Institute, Bangalore, Karnataka

The broad areas of Research by the Council comprise:

- Clinical Research
- Fundamental Research
- Pharmacology Research (Pre clinical Safety/Toxicity and Biological Activity Studies)
- Medicinal Plant Research (Medico-Ethno Botanical survey, Cultivation, Pharmacognosy) Drug standardization Research
- Literary Research & Documentation

The outreach activities include Tribal Health Care Research Programme, Swasthya Rakshan Programme, Ayurveda Mobile Health Care Programme under Scheduled Castes Sub Plan (SCSP), Integration of AYUSH (Ayurveda) with National Programme for Prevention and Control of Cancer, Diabetes, Cardio-vascular disease and Stroke (NPCDCS), Information, Education and Communication (IEC) etc.

Research outcomes

1. Ayurvedic preparations which are developed by CCRAS and technology transferred to industry- AYUSH-64, AYUSH-56 (An antiepileptic preparation), AYUSH-82 (An antidiabetic preparation), AYUSH AG tablet (An Antenatal care preparation) and many others.
2. Research carried out by CCRAS for which patent has been awarded- AYUSH ghutti, Bal rasayan and many processes and formulations.

API (Ayurvedic Pharmacopeia of India)

The word *Pharmacopeia* is composed of two Greek words; *pharmakon*, meaning medicine or charm and *poiein*, meaning to make. It is an official code containing a list of established drugs and medicinal preparations.

Ayurvedic Pharmacopeia of India is a legalized document of the Government of India which describes the quality, purity and strength of selected drugs that are manufac-

tured, distributed, and sold by the licensed manufacturers across India. Once approved by [The Ayurvedic Pharmacopoeia Committee (APC)], compliance with the quality prescribed in API becomes mandatory under the Drugs and Cosmetics Act 1940.

This Pharmacopeia has established standards to evaluate identity, quality and purity of herbs and formulations.

Need for establishing Pharmacopeia for Ayurveda drugs

The raw herb market has challenges of adulteration, substitution of medicinal plants and with increased demand for raw herbs; there is a dire need of standards for identity, quality and purity. With the sole objective to establish these standards for herbal raw material and formulations, API has been published.

API Publications and Volumes

1. Ayurvedic Pharmacopeia of India- Part I: Monographs on single drugs have been published which includes herbs, minerals and extracts. The following table enlists the Volume, its year of publication with the total number of monographs described in each.
2. Ayurvedic Pharmacopeia of India- Part I- As a supporting material for API-Part I, an atlas on Thin Layer Chromatography (TLC) and Macroscopy and Microscopy are under publication. The presently available volumes are presented in the table.
3. Ayurvedic Pharmacopeia of India- Part II: Monographs on formulations have been published.

API- PART I

Volume & Year	Monographs
Vol. I, 1986	80
Vol. II, 1999	78
Vol. III, 2001	100
Vol. IV, 2004	68
Vol. V, 2006	92
Vol. VI, 2008	101
Vol. VII, 2008 (Minerals & Metals)	21
Vol. VIII, 2011 (Hydro-alcoholic & Water extracts)	60
Vol. IX, 2016 (Hydro-alcoholic & Water extracts)	45
Vol. X, 2022 (Minerals & Metals)	20

API- PART II

Vol. I, 2007	50
Vol. II, 2008	51
Vol. III, 2010	51
Vol. IV, 2017	50

Supporting Pharmacopeial publications

	Volume	Monographs
Thin Layer Chromatography (TLC) Atlas	API Drugs Pt. I, Vol. I, 2009 API Drugs Pt. I, Vol. III, 2016	80 99
Macroscopy and Microscopy Atlas	API Drugs Pt.-I, Vol. V, 2009 API Drugs Pt.-I, Vol. I, 2011	92 80

Global Centre for Traditional Medicine (GCTM)

Global Centre for Traditional Medicine is a global knowledge centre for traditional medicine. It was established by World Health Organization (WHO) in Jamnagar, Gujarat, India. The main aim of GCTM is to harness the potential of traditional medicine from across the world through modern science and technology to improve the health of people.

The corner stone for the centre was laid down by Prime Minister of India Sri. Narendra Modi in the presence of Prime Minister of Mauritius Pravind Kumar Jugnauth and Director-General of World Health Organisation Tedros Adhanom Ghebreyesus on 20th April 2022. The establishment of this centre is supported by an investment of USD 250 million from the Government of India.

Purpose

It is estimated that around 80% of the world's population use traditional medicine. Of the 194 WHO Member states, 170 have reported the use of traditional medicine. It is reported that these country's governments have approached for WHO's support in creating a body of reliable evidence and data on traditional medicine practices and products. The mission of WHO is to ensure access to safe and effective treatment to every person across the globe. With the establishment of this centre, it will help to mobilise the power of science to strengthen the evidence base for traditional medicine.

Focus

WHO's Global centre for Traditional Medicine has a strategic focus on the following to optimize the contribution of traditional medicine to global health and sustainable development.

- Evidence and learning
- Data and analytics
- Sustainability and equity
- Innovation and technology

PCIMH (Pharmacopeia Commission of Indian Medicine and Homeopathy)

PCIM&H

Pharmacopoeia Commission for Indian Medicine & Homoeopathy (PCIM&H), Ghaziabad is a subordinate office under Ministry of AYUSH, Government of India. Development of Pharmacopoeias and Formularies as well as acting as Central Drug Testing cum Appellate Laboratory for Indian systems of Medicine & Homoeopathy are the key fields of activity of PCIM&H. The present Chairperson of PCIM&H is Dr Prakash L Hegde, Hassan, Karnataka

The main aim of PCIM&H is to establish quality standards for drugs of Indian Systems of Medicine and Homoeopathy and to act as the Central Drug Testing cum Appellate Laboratory.

Objectives of PCIM&H

1. Quality standards:

a. To develop Pharmacopoeias for drugs/formulations of 'Indian Medicine' and 'Homoeopathy'

b. To develop Formularies of 'Indian Medicine'

c. To revise/update/amend the published Pharmacopoeias and Formularies

d. To publish compendia supplementary to Pharmacopoeias/Formularies of 'Indian Medicine' and 'Homoeopathy' and other related scientific/regulatory information pertaining to functional area of PCIM&H

2. Apex Laboratory : To act as Central Drug Testing cum Appellate Laboratory for 'Indian Medicine' and 'Homoeopathy'

3. Repositories of authentic reference materials : To maintain an authentic Reference Raw Materials (RRM), Reference Chemical Markers (RCM) Repository of raw materials and chemical moieties used in 'Indian Medicine' and 'Homoeopathy'

4. Miscellaneous: To exercise any activity so as to propagate/promote/improvise implementation/ enforcement of provisions of Drugs and Cosmetics Act, 1940 and Rules there under as well as other laws/schemes/programmes of 'Government', relevant to functional area of PCIM&H

References & For further reading

1. National Medicinal Plants Board [Accessed on 24 August 2023] https://nmpb.nic.in/
2. Central Council For Research In Ayurvedic Sciences [assessed 23 Aug 2023] <http://ccras.nic.in/content/patents-and-technology-transfer>
3. Pharmacopeia Commission of Indian Medicine and Homeopathy [Accessed 22 August 2023] https://pcimh.gov.in/show_content.php?lang=1&level=1&ls_id=56&lid=54
4. Catalysing ancient wisdom and modern science for the health of people and the planet accessed 23 Aug 2023] <https://www.who.int/initiatives/who-global-centre-for-traditional-medicine>
5. WHO establishes the Global Centre for Traditional Medicine in India. [accessed 23 Aug 2023] Available from: <https://www.who.int/news/item/25-03-2022-who-establishes-the-global-centre-for-traditional-medicine-in-india>
6. Pharmacopeia Commission of Indian Medicine and Homeopathy [Accessed 22 August 2023]<https://pcimh.gov.in/show_content.php?lang=1&level=1&ls_id=5&lid=5>

Multiple Choice Questions (MCQ):

1. NMPB is established in which year by Government of India

   a. Year 2005 b. Year 2000 c. Year 2010 d. Year 1990

   Ans: b. Year 2000

2. The present Chief Executive Officer (CEO) of NMPB is

   a. Dr Tanuja Nesari b. Dr Vijayalakshmi

   c. Dr Sharavati d. Dr Sahana Kumari

   Ans: a. Dr Tanuja Nesari

3. CCRAS refers to

   a. Central Commission for Research in Ayurvedic Sciences

   b. Central Council for Research in Ayurvedic Sciences

   c. Central Council for Research in Allopathy Sciences

   d. Central community for Research in Ayurvedic Sciences

   Ans: b. Central Council for Research in Ayurvedic Sciences

4. API refers to

   a. Ayurvedic Pharmaceuticals of India

   b. Ayurvedic Pharmacognosy of India

c. Ayurvedic Publications of India

d. Ayurvedic Pharmacopeia of India

Ans: d. Ayurvedic Pharmacopeia of India

5. GCTM refers to

a. Global Centre for Traditional Medicine

b. Global Council for Traditional Medicine

c. Global Centre for Trans disciplinary Medicine

d. Global Community for Traditional Medicine

Ans: a. Global Centre for Traditional Medicine

6. Global Centre for Traditional Medicine is established in which city

a. Jaipur b. New Delhi c. Bangalore d. Jamnagar

Ans: d. Jamnagar

7. PCIMH refers to

a. Pharmacopoeia Commission for International Medicine & Homoeopathy

b. Pharmacopoeia Council for Indian Medicine & Homoeopathy

c. Pharmacopoeia Commission for Indian Medicine & Homoeopathy

d. Pharmaceutical Commission for Indian Medicine & Homoeopathy

Ans: c. Pharmacopoeia Commission for Indian Medicine & Homoeopathy

8. Present Chairperson of PCIM&H (Pharmacopoeia Commission for Indian Medicine & Homoeopathy)

a. Dr Vinod Sharma b. Dr Prakash L Hegde

c. Dr Anand Ahluvalia d. Dr Sanjeev Pathak

Ans: b. Dr Prakash L Hegde

9. Head office of PCIM (Pharmacopoeia Commission for Indian Medicine & Homoeopathy) is located in

a. New Delhi b. Bhopal, MP

c. Ghaziabad, UP d. Kolkatta

Ans: c. Ghaziabad, UP

***

Vrikshayurveda and Ethnomedicine

Contents

- Aurhorship of Vrakshayurveda
- Different Works in the name of Vrakshayurveda
- Contents – 21 sections
- Vrikshayurveda of Parashara (A treatise on Plant Science)
- Definition of Ethnomedicine
- Current scenario of Ethnomedicine
- Ethnomedicinal Plants
- Scope of Ethnomedicine
- Ethnopharmacology

Vrikshayurveda

Author: Sage Surapala, he was awarded with Vaidya Vidyavarenya, A Royal Physician of King Bhimapala

Time period: 10^{th} Century AD

General description regarding the name Vrikshayurveda

'Vrikshsa' means trees and Ayurveda means the science of longevity. So, Vrikshayurveda meansthe science of longevity and the health of plants. It is the ancient Indian science of plant life.

Contents of Vrikshayurveda

Vrikshayurveda mainly deals with various aspects of trees regarding procuring, preserving, treatment of seeds and planting materials, method of irrigation, selection of soil, bio fertilizers and techniques for healthy growth and productivity of plant and plant disease etc.

There are 325 Shlokas in Sanskrit

Different works in the name of Vrikshayurveda:

- ***Vrikshayurveda*** written by Salihotra (around 400 B.C), which describes techniques to help plants and trees to bear fruits throughout the year irrespective of the season, climatic conditions etc.
- ***Vrikshayurveda*** written by Surapala (1000. A.D) — This scripture explains

countless techniques about how to fertilize the soil or raise larger fruits. The cultivation of about 170 plant species are described, including water management, soil conservation, fertilizers, the various diseases affecting the plants and their treatment.

- *Vrikshayurveda of Parashara* – *t*here are different works written by Acharya Parashara on medicine, Astrology, Astronomy, Smriti, agriculture etc. One such work related to Plant science is considered as Vrikshayurveda. At the end of each Chapter there is mentioning of ***'Parashara Krate Vrikshayurvede'***, hence it is included under the *Vrikshayurveda ambit.*

Vrikshayurveda of Surapala

This work has twenty one sector and each has got very good information regarding various aspects of plant science.

Section – 1: Mangalacharanam

- Begins with *Mangalavacharanam* (Obeisance) and followed by importance of Gardens.
- *Shloka* explains about the importance of raising plants –

दशकूप समा वापी दश वापी समो ह्रदः। दश ह्रदसमः पुत्रो दशपुत्र समो द्रुमः ॥ (वृक्षायुर्वेद 6)

- Construction of tank is equal to digging ten well. Ten lakes are equal to a son and one tree is equal to ten sons.
- Benefits of planting tree are discussed in the section.

Section -2

Taru Mahima Vraksha Mahatmya (Significance, Appreciation and fortune of tree)

- In this chapter the importance of plantation of plants with their effects are mentioned. Plants like *Tulasi* (*Ocimum sanctum*), *Bilva* (*Aegle marmelos*), *Ashwattha* (*Ficus religiosa*), *Dhatri* (*Emblica officinalis*), *Vata* (*Ficus benghalensis*), *Nimba* (*Azadirachta indica*), *Plaksha* (*Ficus infectoria*), *Amra* (*Mangifera indica*), *Palasha* (*Butea monosperma*), *Udumbara* (*Ficus glomerata*), *Madhuka* (*Madhuca indica*), *Panasa* (*Artocarpus heterophyllus*), *Jambu* (*Eugenia jambolana*) and the plants yielding flowers and fruits are mentioned with the advantages.
- *Vraksha Ropana Phala* (Advantages of plantation of trees) is explained in the Shloka –

अश्वत्थमेकं पिचुमन्दमेकं न्यग्रोधमेकं दशचिन्चिनीकम् । कपित्थ बिल्वामलक त्रयन्च पन्चाम्रवापी नरकं न पश्यते ॥ (वृक्षायुर्वेद 23)

Person never goes to *Naraka* (hell) who plants tree of *Ashwattha* (one in number), *Nimba* (one), *Nyagrodha* (one), *Chincha* (ten), *Kapittha* (three), *Bilva* (three), *Amalaki* (three) and *Amra* (five).

Section -3: *Nivasanna Taru ropanam* (Plantation of trees adjacent to Residential area)

- In this chapter various aspects of plantation as per directions and type of trees planted and their effects are explained. It is said that all the desires of fulfilled if plantation of *Vata* (Banyan tree) planted in the eastern direction of house. Likewise plantation of *Udumbara* (*Ficus glomerata*) in *Dakshina* (South) and *Ashwattha* (*Ficus religiosa*) in *Paschima* (West) direction will bring *Shubha* (beneficial effects).
- There is also mentioning of restricted trees (Verse 28 & 29) in the campus like *Badari* (*Zizyphus jujuba*), *Kadali* (*Musa paradisiaca*), *Dadima* (*Punica granatum*), *Bijapuraka* (*Citrus medica*), *Eranda* (*Ricinus communis*), *Palasha* (*Butea monosperma*), *Kanchanara* (*Bauhinia variegata*), *Shleshmataka* (*Cordia dichotoma*), *Arjuna* (*Terminalia arjuna*), *Karanja* (*Pongamia pinnata*) etc.

Section – 4: *Vatika Vidhi Yojana* (Garden Layout)

- In this chapter the perfect and imperfect plan for raising garden is explained.
- Shloka explains about in which direction the garden to be raised;

थस्मद्राज्ञां हि शुभदं पुत्रसन्तति वर्धनम् । पस्चिमोत्तर पूर्वेषु भवेदुपवनं हितम् ॥ (वृक्षायुर्वेद 34)

- There should be a provision for making *Vatika* (Garden) towards *Paschima* (West), *Uttara* (North) and *Purva* (East) near the house. If done, it will bring *Putra Santati* (progeny) and *Sannidhi* (Wealth).

Section – 5: *Bhumi Nirupanam* (Land profile)

This section includes *Bhumi Vibhaga* (type of land), *Mrittika Bheda* (type of soil), *Mrittika Varna* (colour of soil), *Mrittika Rasa* (taste of soil), *Aprashasta Bhumi* (unsuitable land), *Prashasta Bhumi* (Ideal land) and various types of trees seen in *Anupa*, *Jangala* and *Sadharana Bhumi* are explained with examples.

Section – 6: *Padapa Vivechana Vistara* (Plant Profile - Extension)

Section contains classification of plants – *Vanaspati* (with invisible flowers), *Druma* (trees), *Lata* (climbers) and *Gulma* (shrubs).

***Padapotpadana* (Propagation of plants)**

A – Plants propagated with seeds – *Jambu* (*Eugenia jambolana*), *Champaka*

(*Michelia champaka*), *Punnaga* (*Calophyllum inophyllum*), *Nagakeshara* (*Mesua ferrea*), *Chincha* (*Tamarindus indica*), *Kapittha* (*Feronia elephentanum*), *Badara* (*Zizhyphus jujuba*), *Bilva* (*Aegle marmelos*), *Priyangu* (*Callicarpa macrophylla*), *Panasa* (*Artocarpus heterophyllus*), *Madhuka* (*Madhuca indica*) and *Karamarda* (*Carissa carandus*).

B – Plants propagated with seeds and stem – *Patala* (*Stereospermum suaveolens*), *Dadima* (*Punica granatum*), *Plaksha* (*Ficus lacor*), *Karavira* (*Nerium indicum*), *Vata* (*Ficus benghalensis*), *Mallika* (*Jasminum sambac*), *Udumbara* (*Ficus glomerata*) and *Kunda* (*Jasminum multiflorum*)

C – Plants propagated with tubers – *Kumkuma* (*Crocus sativus*), *Ardraka* (*Zingiber officinalis*), *Aluka* (*Solanum potatorum*).

Section – 7: *Bijotpatti Vidhi* (Seed viability treatment)

- Section contains different methods of seed viability.
- Bijotpatti procedure – seeds are collected from well ripened fruit, preserved after spraying milk and fumigation with drugs like *Sarshapa* (*Brassica campestris*) and *Vidanga* (*Embelia ribes*) is to be done.
- Then *Bijopachara Phala* (outcomes of seed treatment) is explained. The trees produced by the seed treatment will give best quality fruit and highest yield. With this various rituals followed during *Bijopachara* is very well explained in verse no 51.

Section – 8: *Ropana Vidhanam* (Plantation procedure)

- Section has information regarding *Shubha tithi* (auspicious time) and *Vara* (auspicious day) for the plantation.
- In *Shukla Paksha* – *Padya*, *Purnima*, *Panchami* and *Trayodashi*.
- Among days – Thursday, Wednesday, Friday and Monday.
- Recommened *Nakshatra* (Stars) – *Vishakha*, *Magha*, *Mula*, *Chitta*, *Uttara*, *Bhadrapada*, *Uttarashada*, *Uttaraphalguni*, *Anuradha*, *Jyeshta* nd *Krittika*.

***Vraksha Ropana Vidhi* (Plantation of tree saplings)**

Verse - 63, Land should be made flat before sowing the seeds or raising seedlings. The distance to plant should be calculated as per type of the plant.

a) Space for the trees – 14 to 20 *Hasta* (hands)

b) Space for shrubs – 4 to 5 *Hasta* (hands)

c) *Puga* (*Areca catechu*) – 2to 3 Hasta (hands) for *Puga*

- Procedures for pit preparation (*Gatra Swabhikarana*), *Vapana* (sowing) are explained in verse 68&69.
- Procedure to propagate *Marubaka* (*Origanum majorana*), *Phanijjaka*,

Shatapatrika, *Dadima* (*Punica granatum*), *Karanja* (*Pongamia pinnata*), *Kadali* (*Musa paradisiaca*), small plants and large plants are mentioned.

Section – 9: *Vraksha Ropana Uddesha* (Objectives of plantation)

- Plants guard the creatures by protecting from various problems, disasters and troubles hence should be raised and conserved.
- *Padapa Raksha* (plant protection) – various safety measures to protect the plant (verse 99) are mentioned. Like paste of *Tila* (*Sesamum indicum*) and *Vidanga* (*Embelia ribes*) to protect from insects.

Kunapa Jala **(Liquid manure)** – verse 101.

Excreta, bone marrow, brain, muscles, blood and body parts of pigs mixed with water and stored for 15 days underground which is known as *Kunapa Jala*.

Other type of manures are mentioned in verse 103 to 106.

Section -10: *Sinchana Vidhana* (Irrigation)

This section contains *Saptahika Sinchana* (weekly irrigation), sunlight, protection, regular irrigation.

Number of Times irrigation to be given;

- *Anupa Desha* – once in 5 days.
- *Sadharana Desha* - Regular irrigation
- Spring season - Daily evening
- Summer Season – Daily thrice
- Winter season -alternate days

With water even *Kunapa Jala* can also be sprayed.

De-weeding: undesirable grass or weeds grown on ground and around the plants should be cleared with various equipments.

Dhupana **(Fumigation):** Various methods including using of medicinal plants (*Vidangadi Dhupana*) and snakes fat is also mentioned.

Section -11: *Utpadana Vriddhi Vidhi* (Measures for high Yield)

Twiners - The procedure for fumigation with *Shaphari Matsya* (specific variety of fish) mixed with *Ghrata* (Ghee) then sprinkle with Kola and Rat fat. This procedure increases the yield of flowers and fruits. Likewise specific measures are mentioned for *Draksha* (*Vitis vinifera*), *Amra* (*Mangifera indica*), *Narikela* (*Cocos nucifera*) and *Dadima* (*Punica granatum*).

Section – 12: *Padapa Kudrashti Nivarana* (Protection / Counter sight on plants)

Various measures taken to prevent or eliminating adversaries relating to plants caused by '*Kudrashti*' are given with selected instances in this section (verse 132). The plants like *Dadima* (*Punica granatum*) and *Amra* (*Mangifera indica*) are mentioned like tying broken earthen pot or skull.

Section – 13: *Vrakshotpada Vraddhi Prayoga Vidhanam* (Measures for increasing plants produce)

- The section contains explanation regarding how to increase the yield of any fruit yielding plants by following various measures. Fruit yielding plants like Panasa (Artocarpus heterophyllus), *Bilva* (*Aegle marmelos*), *Kapittha* (*Feronia elephentanum*), *Kadali* (*Musa pardisiaca*), *Tinduka* , *Paravata*, *Matulunga* (*Citrus medica*), *Naranga* (*Citrus reticulata*), *Madhuka* (*Madhuca indica*) etc are mentioned.
- There is also explanation regarding how to increase the yield of flowers of *Ketaki* (*Pandanus roxburghi*) Plant.

Section – 14: *Dohada Nirupanam* (Process of *Dohada*)

- Various measures mentioned to make the plants to give flower or to bloom. Plants like *Bakula* (*Minusops elengi*), Makanda, *Ashoka* (*Saraca asoka*) , *Kurabaka*, *Tilaka*, *Mallika*, *Patala* (*Stereospermum suaveolens*), *Karpasa* (*Gossypium herbaceum*), *Yuthika*, *Saptaparna* (*Alstonia scholaris*) and *Shephalika* (*Nyctanthus arbortristis*) are mentioned.
- Even vegetable plants are also mentioned with measures to increase the yield; like Patola and Alambu are explained.
- Conduction of marriages of plants for blooming is also mentioned in Verse no 151.

Section -15: *Padapa Rakshana Vidhana* (Plant Protection)

This section includes explanations regarding various measures followed to protect the plants. Procedures to protect from mist, hailstorm and rats are mentioned. *Mantra* (Hymn) are mentioned to chant in protecting plants from external attack in the verse no 162.

Section – 16: *Roga Vijnaniyam* (Disease Diagnostics)

- The section contains explanation about classification of diseases, diseases originated from *Vata*, *Pitta* and *Kapha* with their aetiopathology, symptamatology, and various injuries to plants, defective seeds (*Bija Dosha*) and measurements (*Bija Upachara*).

- Causes for destruction of trees are mentioned in this section.

Section – 17: *Roga Chikitsa* (Disease treatment)

- The treatment for *Vata Vyadhi* – lie spraying of *Kunapa Jala* (liquid manure), fumigation therapies by using different substances is mentioned in verse 185 & 186.
- Treatment for *Kapha Roga* – Using *Kwatha* (decoction) of *Brihat Panchamula*, applying of paste or spraying with medicinal preparations is mentioned in verse 187 & 188.
- Treatment for *Pitta Roga – Madhu yashtyadi Kwatha* and *Phaladi Kwatha* is mentioned.
- Measures to control or cure worm infestation with medicinal plant preparations is nicely explained in this section.
- Treatment to heal the wound or injury to the plant, adverse effects of nature, broken or fracture of tree parts, cracks in the branches, burn, thunderbolt, lack of water, mistreatment effect, sterility etc. are explained meticulously.

Section – 18: Improvement Care

Treating or improving:

Treating or improving growth of plants needs specific measures. These are explained in this section.

Measures for *Ajirnambu* (excessive water from irrigation), diseases of vegetables, measures to take care of small plants are mentioned.

Section – 19: *Vichitra Vidhanam* (Horticulture wonders)

- Measures to maintain during flowering stage, fruiting stage, production of fruit without seeds, changing the colour of the flowers, suppressing bad odour, conversion of trees in to twiners, cross breeding, hybridization, prolonging life span, and enhancement of size of flower and fruits are mentioned in this section.
- Even blending the fragrance, producing fruits with specific taste and dwarfing of plants are mentioned.

Section – 20: Garden Projects

This section contains information regarding how to raise the garden and what are the prerequisites for garden like Pond (water resources), small house and measures for purifying the dirty water for irrigation purpose.

Section – 21: *Kupa Sthala* (Underground water)

Various informations to predict the presence of underground water is mentioned. Presence of particular trees in the land in particular direction is one of the prediction method mentioned in this section.

In total there are 21 sections with total number of shlokas are 325.

Vrikshayurveda of Parashara (A treatise on Plant Science)

Parashara's Vrksayurveda is supposed to be the most ancient work in actual botany, to have been composed during first century BC and first century AD.

In his *Vrksayurveda*, Parasara developed a more elaborate classification.

There is Five Kanda (Parts)

1. The First Part Bijotpatti Kanda contains eight chapters:

Chapter I – Bijotpattisutriya Adhyaya – This chapter contains general introduction to the subject matter and gives in brief account of the origin of life. Total number of Shlokas are 16.

Chapter II – Bhumi Varga Sutriya Adhyaya – This chapter gives an account of the classification of lands according to the soil and the climate with an outline of the flora characteristic to each type of land. Number Shlokas are 18.

Chapter III – Vana Varga sutriya Adhyaya – includes information about distribution of forests in ancient India. Number of Shlokas are 21.

Chapter IV – Vrakshanga Sutriya Adhyaya – It deals with the leaf and its various parts and leaf like appendages, it also includes a description of the internal structure of the leaf. Total number of Shlokas are 84.

Chapter V – Pushpanga Sutriya Adhyaya – it describes regarding different parts of a flower; various types of flowers according to their shape and form; and also provides a system of classification of plants based upon their floral characteristics. Total Shlokas are 94.

Chapter VI – Phalanga Sutriya Adhyaya – it describes the fruit and its various parts; various kinds of fruits according to their shape, form and other morphological peculiarities. Number Shlokas are 48.

Chapter VII – Ashtanga Sutriya Adhyaya - it deals with the eight different plant parts viz; root, stem / trunk, heart-wood, sap, exudates, oleaginous substances, spines and prickles. The details of each of these plant parts as to their morphology or the physical properties or functional roles have been furnished. Number Shlokas are 53.

Chapter VIII – Dwiganiyadhyaya – it gives an account of the seed and the seed-

ling and the process of germination, and various methods of propagation of plants. Number of Shlokas are 39.

2. Vanaspati Kanda – it is divided in to three chapters

Chapter I – Vanaspati Nirvarnanaadhyaya - contains a general description of plants belonging to the group Vanaspati (Moraceae family)

Chapter II – Vraksha Gana sangrahamadhyaya – Plants explained with examples.

Chapter III – Trana Varga Adhyaya - comprising plants of Poaceae family.

3. Vaanaspati Kanda – it gives descriptive account of families with their special features;

a) Chuta Pushpa Gana (Anacardaceae)

b) Deva Pushpa Gana (Myrtaceae)

c) Puplika Gana (Rutaceae)

d) Aksha Pushpa Gana (Combretaceae)

e) Kuha Pushpa Gana (Rhamnaceae)

f) Mallika Pushpa Gana (Apocynaceae)

g) Shami Varga (Fabaceae)

4. Gulma Kshupa Kanda – it deals with the type of plants belonging to the Araceae family which grow in moist and clayey soil and also describes the morphological features of plants grouped as Simhapushpa Gana (Acanthaceae) – Gulma (Shrub).

5. Virudha Valli Kanda – In this only 23 creepers are mentioned.

References:

1. Vrakshayurveda of Surapala by Dr Gyanendra Pandey, Chaukhambha Sanskrit Series Office, Varnasi.
2. Vrakshayurveda of Parashara by N. N Sircar & Roma Sarkar, Sri Satguru Publications, New Delhi.

Ethnomedicine

Definition of Ethnomedicine

Ethnomedicine refers to the study of traditional medical practice which is concerned with the cultural interpretation of health, diseases and illness and also addresses the healthcare- seeking process and healing practices.

Ethnomedicine is the study of traditional medical systems and the medicinal plants

used by Indigenous communities. In other words, Ethnomedicine refers to the traditional medical practices and beliefs of a particular cultural or ethnic group.

Traditional knowledge (TK) refers to the knowledge, innovations and practices of indigenous and local communities around the world. Developed from experience gained over the centuries and adapted to the local culture and environment, traditional knowledge is transmitted orally from generation to generation.

The practice of ethnomedicine is a complex multi-disciplinary system constituting the use of plants, spirituality and the natural environment and has been the source of healing for people for millennia.

Current scenario of Ethnomedicine:

Research interest and activities in the area of ethnomedicine have increased tremendously in the last decade. Since the inception of the discipline, scientific research in ethnomedicine has made important contribution to the understanding of traditional subsistence, medical knowledge and practice. The explosion of the ethnomedicine literature has been stimulated by an increased awareness of the consequences of the forced displacement or acculturation of indigenous people, the recognition of indigenous health concepts as a means of maintaining ethnic identities, the search for new medical treatments and technologies.

The ethnomedicinal uses of plants are one of the most successful criteria used by the pharmaceutical industry in finding new therapeutic agents for the various fields of biomedicine.

Examples

Some outstanding medicinal drugs which have been developed from the ethnomedicinal uses of plants include: Vinblastine and Vincristine from *Catharanthus roseus* (the periwinkle) used for treating acute lymphoma, acute leukaemias *etc*, reserpine from *Rauwolfia serpentina* (Indian snake root) used for treating hypertension, aspirin from *Salix purpurea* (willow) used for treating inflammation, pain and thrombosis and quinine from *Cinchona pubescens* (cinchona) used for treating malaria.

Today about 80% of the world's population rely predominantly on plants and plant extracts for healthcare.

The spiritual aspects of health and sickness has been an integral component of the ethnomedicinal practice for centuries, a dimension ignored by biomedicine practitioners, because of the difficulties involved in validating its success using scientific principles and experiments. The ethnomedical system (primitive medicinal systems or traditional medicine) has two universal categories of disease aetiology – natural and un-natural (super-

natural) causes. Natural illness explains illness in impersonal systemic terms. Thus, disease is thought to stem from natural forces or conditions such as cold, heat and possibly by an imbalance in the basic body elements.

Today, ethnomedical practices and beliefs are part of a total belief system that transcends class, ethnicity and religious belief in such a manner that the terms "folk or traditional" can be used to describe practices that are truly universal.

According to data released by the World Health Organization (WHO), ethnomedicine has maintained its popularity in all regions of the developing world and its use is rapidly expanding in the industrialized countries.

Anthropological studies examine the cultural perception and context of a traditional medicine. Ethnomedicine has been used as a starting point in drug discovery, specifically those using reverse pharmacological techniques.

Ethnomedicine or natural products have encouraged several developments in drug discovery. There are many historical annals in which ethnomedicine helped to divulge navel aspects of drug isolation. Studies in ethnomedicine are the pioneer natural attempts to combat human afflictions..

Ethnomedicinal Plants:

Acanthaceae

- *Andrographis paniculata* - Leaf or whole plant extract in solution form administered against liver problem and during high fever.
- *Hygrophila schulli* –Leaves and young stems are boiled and extract consumed against anemia.
- *Justicia adhatoda* L. - Leaf extract is used to treat chronic bronchitis, fever, cough and cold.
- *Justicia gendarussa* Burm. f. - Acanthaceae - Crushed leaves are dressed on cut and wounds. Leaf extract is applied on the forehead for relief against headache.

Arecaceae

- *Acorus calamus* L. - Root/leaf extracts solution consumed orally during stomach disorders, bronchitis and fever. A small piece of root or leaf is chewed to clear the throat.

Amaranthaceae

- *Achyranthes aspera* Linn. - Root is used for diarrhea and cough and dried leaves are used for treating asthma

Amaryllidaceae

- *Alternanthera brasiliensis* (L.) Kuntze - Leaves are crushed and dressed on the wound to prevent bleeding.
- *Allium sativum* - Cloves are used for controlling blood pressure.

Apiaceae

- *Centella asiatica* Linn. - Leaf extract is taken orally to cure diarrhea and dysentery.
- *Rauvolfia serpentina* (L.) Benth ex Kurz. - Leaf extract is applied externally on eyes to cure opacities of cornea juice and taken orally during fever. Crushed root is applied on cuts, wounds and furuncle (boil).
- *Alstonia scholaris* (L) R.Br - The white portion of the bark is soaked overnight, and the solution consumed orally empty stomach during early morning cure to stomach ache. Crushed bark paste is externally applied on the infected portion of the skin to cure an infection.

Arecaceae

- *Cocos nucifera* L. - Coconut milk is a refreshing drink and health tonic and also consumed to get relief from stomach problems. Fruit is sacred and used during religious ceremonies.

Asteraceae

- *Tagetes erecta* L. - The crushed leaf is applied to the cut to stop bleeding. Leaf extract solution is orally consumed 2–3 times a day to cure pneumonia.
- *Artemisia vulgaris* L. - The leaf is diuretic so consumed orally to get relief from pain and fever.

Bignoniaceae

Oroxylum indicum (L.) Benth. - The white portion of the bark is burnt, and ash is applied to the wound for fast healing. Flower or bark extract solution is mixed with honey and consumed 3–4 times a day to cure jaundice.

Caricaceae

Carica papaya L. - Fruit either consumed raw after cooking or ripe during jaundice. Raw fruits are generally used for culinary purpose, and ripe fruits usually are dessert.

Combretaceae

- *Terminalia arjuna* (Roxb.) Wight &Arn. - Bark extract obtained after boiling in solution form is orally consumed to relieve stomach and diarrhoea's burning sensation. The same therapy is applied to cattle also.

- *Terminalia bellirica* (Gaertn.) Roxb. - Dried fruit or powder with water is orally consumed to treat dyspepsia and used as a cooling agent.
- *Terminalia chebula* (Gaertn) Retz. - Fresh or dried fruits are consumed to get relief from stomach disorder.

Phyllanthaceae

Emblica officinalis Gaerth - Raw fruits or their paste consumed orally to get relief from stomach disorders. Fruits are also processed as candy, chutney and pickles.

Fabaceae

Cassia fistula L. - Tender leaves are boiled, cooked and consumed after a meal to get relief from stomach pain.

Lamiaceae

- *Clerodendrum viscosum* L. - Young leaves are consumed raw, or its extract administered orally to cure fever. Young buds are eaten for deworming. Leaf extract is body messaged while bathing to get relief from dermal itching.
- *Mentha piperita* L. - Leaves are either consumed raw or processed as chutney and in solution to get relief from flatulence, diarrhea, and nausea.
- *Ocimum gratissimum* L. - Leaf or flower is consumed raw to cure a cold and cough, fever, diarrhea, dysentery and skin diseases.
- *Ocimum sanctum* L. - The leaf is either eaten raw or its extract is mixed with honey and orally consumed 3–4 times a day to cure a cold and cough.
- *Leucas aspera* (Willd.) Link - Leaf extract is orally consumed to cure stomach disorder. Leaves are crushed and inhaled to get relief from headache. Crushed leaves are also applied on cuts to stop bleeding.

Liliaceae

Asparagus racemosus Willd. - The dried root is powdered and consumed in solution form to treat diabetes and dysentery.

Malvaceae

- *Abroma augusta* (L.) L. f. - Leaf, bud or root extract mixed with honey is orally administered to cure urinary problems. Leaf extract is inhaled to stop bleeding nose. Dried powder of the entire plant is administered orally to cure bronchitis and cough.
- *Hibiscus rosa-sinensis* L. - Flower paste in solution form is administered orally 4–5 times a day to control blood dysentery and get relief from a burning sensation in the stomach.

Meliaceae

Azadirachta indica A. Juss - Water boiled with leaves is used for bathing to cure dermal rashes. Fried leaves are eaten to regulate blood sugar and to cure diabetes.

Menispermaceae

Tinospora cordifolia (Willd.) - The bark is soaked overnight in water and consumed in the morning empty stomach to treat against rheumatism and jaundice.

Mimosaceae

Mimosa pudica L. - Decoction of leaf and bark is used to control Orchitis and used as depurative.

Moringaceae

Moringa oleifera Lam. - Leaf and fruits after cooking are consumed to regulate blood pressure and cure gastroenteritis.

Myrtaceae

Psidium guajava L. - Tender leaves are eaten raw, or their extract is consumed to control diarrhea.

Piperaceae

Piper betel L. - Leaf and root are either eaten raw or extract are orally consumed to cure a cold, cough and gastroenteritis.

Piper nigrum L. - Seeds are boiled with sugar, salt and consumed 3–4 times a day to control asthmatic problems, cold, cough and rheumatism.

Poaceae

Cynodon dactylon (L.) Pers. - Leaves are crushed and applied on cut and wounds for fast healing.

Rutaceae

- *Aegle marmelos* (L.) Corr. - Ripe fruit and seed or fruit juice are consumed to get relief from stomach problem.
- *Murraya koenigii* (L.) Sprenge - Leaf, bark or root extract is administered orally to cure black fever and diarrhea.

Solanaceae

Datura metel L. - Fresh or dried leaves, seeds or flowers are used as a pain killer.

Zingiberaceae

- *Curcuma aromatica* Salisb. - Fresh rhizome paste is applied to the infected part to check inflammation.

- *Curcuma longa* L. - Rhizome paste is used as an antiseptic and mixed with salt consumed orally to treat cough and cold.
- *Zingiber officinale* Rosc. - The rhizome is eaten fresh or dry as a stimulant for digestion and to cure cough and cold.

Scope of Ethnomedicine

The study of the adaptation of human aggregates or groups is a proper domain of ethnomedical science. The analysis and explanation of how social groups adapt and function from a medical standpoint necessarily brings ethnomedicine into the orbit of population biology, sociology, and history.

Ethnopharmacology

It includes pharmacognosy, phytotherapy (study of medicinal plants) use and ethnobotany, as this is a source of lead compounds for drug discovery. Emphasis has long been on traditional medicines, although the approach also has proven useful to the study of modern pharmaceuticals.

Ethnopharmacology is a related field which studies ethnic groups and their use of plant compounds. It is linked or it involves studies of the:

1. Identification and ethnotaxonomy (cognitive categorization) of the (eventual) natural material, from which the candidate compound will be produced.
2. Traditional preparation of the pharmaceutical forms.
3. Bio-evaluation of the possible pharmacological action of such preparations (ethnopharmacology).
4. Their potential for clinical effectiveness.
5. Socio-medical aspects implied in the uses of these compounds (medical anthropology).

Hence, ethnomedicine is very important contribution to the field of medicine as it helped the local people to get rid of their disease and helped in maintaining good health. Now also number of communities continues to adopt the ethnomedicines for their health needs. Ethnomedicine has been considered as the most significance in new drug discovery.

Reference:

1. Ethnomedicinal Plants by Pravin Chandra Trivedi, Pointer Publishers, Jaipur.

Multiple Choice questions (MCQ):

1. Vrikshayurveda is written by

   a. Charaka b. Surapala c. Sushruta d. Narahari

   Ans: b. Surapala

2. Vrikshayurveda of Surapala belongs to which century
   a. 15^{th} b. 5^{th} c. 10^{th} d. 20^{th}
   Ans: 10^{th} Century
3. In Vrakshayurveda it is mentioned that planting one tree is equal to how many sons
   a. 5 b. 12 c. 8 d. 10
   Ans: d. 10 Sons
4. Number of sections present in Vrikshayurveda of Surapala
   a. 21 b. 25 c. 15 d. 12
   Ans: a. 21
5. An Example for the plant propagated with tubers
   a. Eranda b. Kumkuma c. Jambu d. Kapikacchu
   Ans: b. Kumkuma
6. Kunapa Jala refers to
   a. Solid Manure b. Lake c. Well d. Liquid Manure
   Ans: d. Liquid Manure
7. Vidangadi Dhupana is mentioned for
   a. Deweeding b. Fumigation c. Irrigation d. Harvesting
   Ans: b. Fumigation
8. Madhuyashtyadi Kwatha is told in the contest of diseases related to
   a. Vata Vyadhi b. Kapha Vyadhi c. Pitta Vyadhi d. Sannipata
   Ans; c. Pitta Vyadhi
9. The study of traditional medical systems and the medicinal plants used by Indigenous communities is called
   a. Ethnobotany b. Ethnic Culture c. Ethnomedcine d. Ethno Science
   Ans: c. Ethnomedicine
10. Reserpine from *Rauwolfia serpentina* (Indian snake root) used for treating hypertension is an example for
    a. Ethnoscience b. Ethnomedicine c. Ethnic Culture d. Ethnobotany
    Ans: b. Ethnomedicine

*****

22 Chapter

Network Pharmacology and Bioinformatics

Contents

- Introduction to Network Pharmacology
- Theoretical Fundamentals
- Methodology of Network Pharmacology Research
- Data sources
- Big data analytics
- Network construction and interaction prediction
- Network analysis
- Network visualization
- Applications of Network pharmacology
- Network pharmacology and Ayurveda- Triphala
- Definition of Bioinformatics
- Need of Bioinformatics
- Aim of Bioinformatics
- Components of Bioinformatics
- Database
- Database Mining Tools (Analysis Tools)
- Applications of Bioinformatics
- Exercises on Network Pharmacology

Network Pharmacology

Introduction

Drug discovery, the process by which new candidate medications are discovered, initially began with random searching of therapeutic agents from plants, animals, and naturally occurring minerals. For this, they depended on the Materia medica that was established by traditional medicine from that era. This was followed by the origin of classical pharmacology in which the desirable therapeutic effects of small molecules were tested on intact cells or whole organisms. Later, the advent of human genome sequencing revolutionized the drug discovery process that developed into target–based drug discovery, also known as reverse pharmacology. This relies on the hypothesis that the modulation of the activity of a specific protein will have therapeutic effects. The protein that the

drug binds to or interacts with is also referred to as a "target." In this reductionist approach, small molecules from a chemical library are screened for their effect on the target's known or predicted function. Once the small molecule is selected for a particular target, further modifications are carried out at the atomic level to ameliorate the lock-and-key interactions. This one-drug/one-target/one-therapeutic approach was followed for the last several decades.

In drug discovery and development, technology was used to synthesize highly specific mono-targeted molecules that mimic the bioactive from natural compounds rather than understanding the rationale behind their synergistic action and developing methods to isolate the bioactives from natural resources. Natural products normally act through modulation of multiple targets rather than a single, highly specific target. Researchers now understand that most diseases are due to dysfunction of multiple proteins. Thus, it is important to address multiple targets emanating from a syndrome-related, metabolic cascade, so that holistic management can be effectively achieved. Therefore, it is necessary to shift the strategy from one that focuses on a single-target, new chemical entity to one of a multiple-target, synergistic, formulation-discovery approach.

Definition

A new discipline called network pharmacology (NP) has emerged which attempts to understand drug actions and interactions with multiple targets. As a consequence, Hopkins (2007, 2008) put forward the concept of network pharmacology. Network pharmacology devotes to understand drug's pharmacological mechanism in the network perspective. Network pharmacology is an interdisciplinary science based on pharmacology, network biology, systems biology, bioinformatics, computational science, and other related scientific disciplines. Network pharmacology aims to understand diseases at the systematic level, and to know the interaction between the drug and the body on the basis of equilibrium theory of biological networks. It tries to exploit the pharmacological mechanism of drug action in the biological network, and helps to find drug targets and enhance the drug's efficacy.

Theoretical Fundamentals

Pharmacology- Pharmacology is the branch of medicine and biology on drug action where a drug can be broadly defined as any man-made, natural, or endogenous molecule which exerts a biochemical and/or physiological effect on the cell, tissue, organ, or organism. It aims to study the interactions between a living organism and chemicals that affect normal or abnormal biochemical function.

Network biology- focuses on (both dynamic and static) nodes (molecules, metabolites, cells, etc.) and between-node interactions in biological networks (pathways, ecosys-

tems, etc.). It is a method of representing systems as complex sets of binary interactions or relations between various biological entitites. A typical graphing representation consists of a set of nodes connected by edges. It could be protein-protein interaction networks or DNA-protein interaction networks or metabolic networks or food web.

Systems biology- Hood (1998) first proposed the scientific discipline, sytems biology, and defined it as the science that studied all components and their interactions in biological systems. According to this view, the organism is a complex system containing many interactions between components (genes, proteins, mRNAs, small molecular metabolites, etc.) at multiple layers (cell, tissue, organ, and whole body) of the organism.

Omics- Inspired by the terms genome and genomics, other words to describe complete biological datasets, mostly sets of biomolecules originating from one organism, have been coined, with the suffix -ome and -omics, like metabolomics, microbiomics, pharmacogenomics, secretomics etc.,

Methodology of Network Pharmacology Research

Network pharmacology research revolves around identifying compound and disease related genes, constructing a protein–protein interaction (PPI) network, and lastly, analyzing and visualizing the network. The construction of molecular networks from large databases is a simple start. Then, using network analysis, key nodes are identified and key biological pathways are predicted. Finally, additional network validation is performed to successfully validate the interaction between highly active constituents and their putative targets. In network pharmacology, some common steps include

1. Data sources
2. Big data analytics
3. Network construction & interaction prediction
4. Network analysis
5. Network visualisation

Data sources

There are two sources of fundamental data for research in network pharmacology, public databases and experimental verification. First, we can use public databases, i.e., the existing public data and published data, to construct network models of the specific disease and drug target, to predict the drug target; further, to construct drug-target-disease network and analyze pharmacological mechanism of the drug, and finally validate the mechanism through experiments. Second, we may use -omics technologies and high - throughput technologies to investigate the interactions between the drug and network model, to construct and analyze drug-target-disease network based on the generated data, and to analyze pharmacological mechanism of drug action.

Available databases and resources are:

Identify drug candidates:

1. Drug Bank 2. ChEMBL 3. ChemBank

Disease target identification

1. Therapeutic target database
2. DisGeNET- Database of gene-disease associations

Target identification

1. BindingDB- protein-drug binding affinities
2. DINIES- web server to infer potential drug target interaction network
3. SwissTarget Prediction- web server to deduce the targets of bioactive small compounds based on the combination of 2D and 3D similarity values with the known ligands

Target- drug interactions

1. MATADOR 2. SuperTarget 3. STITCH

Network construction

1. KEGG Pathway database on genes and genomes for understanding high level functions and utilites of the biological system
2. STRING- function protein association network
3. PPI Network- protein-protein interaction network

Network visualisation

1. Cytoscape 2. Topographica 3. Netlogo

Others

1. TDR Target database- chemogenomics databank regarding tropical diseases
2. Cancer DR- database on anticancerous agents

Big data analytics

Big data is the data sets so large or complex that conventional data processing techniques are inadequate. Big data analytics is the process of examining big data to uncover hidden patterns, unknown correlations and other useful information. With big data analytics, e.g., high-performance data mining, predictive analytics, text mining, forecasting and optimization, we can analyze huge volumes of data that conventional analytics cannot handle. In addition, machine learning techniques are ideally suited to addressing big data needs. Many problems in network pharmacology, network construction, interactions prediction, etc. are also expected to be addressed by using big data analytics.

Network construction and interaction prediction

For a disease and the corresponding drug, the pharmacological network is the most important basis for further pharmaceutical studies. However, most pharmacological networks are unknown or imperfect. Therefore, how to construct a pharmacological network is a prerequisite for such diseases. Among them, the networks of disease related protein interactions are the most important. The most used methods to find such interactions and construct pharmacological networks include phylogenetic profile. Venn diagrams tools are preferable for identifying overlapped targets of diseases and compounds. This step mainly aims to predict disease-related genes and subsequently identify the common genes between diseases and compounds. The common genes are initial touchstones for further screening.

Network analysis

Network is a well-computed mathematical representation of various connected nodes and edges. A major portion of the network pharmacology is network analysis which mainly covers attribute analysis, topological analysis, network structure and stability, flow (flux) balance analysis and network models. A network analysis usually measures module, betweenness, hub, node, edge, shortest path and degree of hub gene.

- Module: A group of nodes that act in concert to perform a specific function.
- Hub: A node with high degree.
- Degree: the number of edges connected to a node.
- Betweenness: the number of shortest paths that go through a given specific node.
- Shortest path: A minimum path between any two nodes in a network
- Edge: an association/interaction/ any well-defined relationship

Network analysis is carried out to understand the mechanism of medicinal plants in disease treatment. Protein–protein interactions (PPI) are highly significant by virtue of having a high versatility, adaptability, and specificity. The PPI network of key targets (common genes) is obtained through databases that provide the functional interactions among key targets. Later, the network analysis is performed to predict the hub genes that have the best degree of connectivity. Network analysis tries to uncover important targets, active ingredients, and their associated pathways by identifying targets. GO enrichment analysis and KEGG pathway analysis provide exclusive key target features by exploring their associated pathways.

Network visualization

It aims to present users with the static/dynamic two- or three-dimensional illustra-

tions and images of biological network. Thera re a variety of such network software for doing it, like ABNNSim, Cytoscape and others.

Applications

- Helps to better understand the influence of behaviours of cells and organs in functional phenotypes.
- To understand the mechanism of drug functioning
- To provide theoretical basis and technical support for drug design and for rational use of drugs
- Helps to predict and explain drug interactions
- To find factors that affect drug efficacy and safety
- To quickly discover biomarkers and drug targets

Network pharmacology and Ayurveda- Triphala

[Ref: Uma Chandran, Neelay Mehendale, Girish Tillu, Bhushan Patwardhan. Network Pharmacology of Ayurveda Formulation Triphala with Special Reference to Anti-Cancer Property. *Combinatorial Chemistry & High Throughput Screening*, 2015, *18]*

Triphala consists of the myrobalans, Emblica *officinalis* (*Phyllanthus emblica*), *Terminalia bellerica*, and *Terminalia chebula*. In Triphala, these myrobalans are normally used as a mixture consisting of an equal proportion of all the three. This combination has putative synergistic properties. Triphala is considered as a good Rasayana, which improves immunity and facilitates nourishment to tissues. With antioxidant and anti-aging effects, it is used for strengthening the vital organs, for improving skin and hair quality, for diabetic wound management and as a general health promoter. This study has used network pharmacology as a tool to understand the pharmacodynamics of *Triphala* as an intelligent formulation, which can be used for several indications. The available information regarding bioactives of *Triphala* botanicals have been used to construct pharmacology networks involving putative targets and related diseases. As an example, a detailed analysis to show the potential of *Triphala* in cancer therapeutics is attempted in this study. The study reports that a network of *Triphala*-disease shows that *Triphala* can act against 15 disease types involving 74 different disease indications through modulation of 31 protein targets. Thus, network pharmacology is an effective computing tool to understand the intelligence behind traditional medicine through systematic data mining, information synthesis and collating bioactives, targets, pathways and the associated indications.

Bioinformatics

Definition

(Molecular) bio – informatics: bioinformatics is conceptualising biology in terms of molecules (in the sense of physical chemistry) and applying "informatics techniques" (derived from disciplines such as applied maths, computer science and statistics) to understand and organise the information associated with these molecules, on a large scale. In short, bioinformatics is a management information system for molecular biology and has many practical applications. [As submitted to the Oxford English Dictionary]

In simpler terms, Bioinformatics may be defined as the application of computational techniques to understand and organise the information associated with biological macromolecules.

Need

Biological data are flooding in at an unprecedented rate, for instance as of August 2000, the GenBank repository of nucleic acid sequences contained 8,214,000 entries and the SWISS-PROT database of protein sequences contained 88,166. On average, the amount of information stored in these databases is doubling every 15 months. As a result of this data surge, it's a challenge to organise and analyse data which may be effectively handled by the ever- advancing computer technology.

Aim

The aims of bioinformatics are three-fold.

1. First, at its simplest, bioinformatics organises data in a way that allows researchers to access existing information and to submit new entries as they are produced, eg the Protein Data Bank for 3D macromolecular structures
2. The second aim is to develop tools and resources that aid in the analysis of data, programs such as FASTA and PSI-BLAST
3. The third aim is to use these tools to analyse the data and interpret the results in a biologically meaningful manner.

Components of Bioinformatics

This includes Data, Database and Data mining tools

Data: Data could be information on gene, nucleic acid, protein, clinical or literature

- Nucleic Acid Sequences
  - Raw DNA Sequences
  - cDNA sequences
  - Organellar DNA sequences
  - Genomic sequence tags (GSTs)
  - Expressed sequence tags (ESTs)
  - RNA Sequences Protein sequences

- Protein structures
- Metabolic pathways
- Gel pictures
- Literature

Databases

A database is a vast collection of data pertaining to a specific topic e.g. nucleotide sequence, protein sequence etc., in an electronic environment. Database are computerized storehouse of data (records) which is the core of Bioinformatics. It has standardised formats which allows extraction of specified records, adding, changing, removing, and merging of records.

Depending on the type of data collected together, different databases are available:

- Nucleotide sequence
- Structural Databases
- Micro-array Databases
- Pathway Databases
- Integrated Databases
- Sequence Databases
- Enzyme Databases
- Clinical Database
- Chemical Databases
- Bibliographic Databases

Examples of Database:

- NCBI - GenBank: (www.ncbi.nlm.nih.gov/GenBank) – EMBL: (www.ebi.ac.uk/embl) – DDBJ: (www.ddbj.nig.ac.jp) are examples of Nucleotide sequence database.
- TrEMBL, PIR, SWISS-PROT are examples of Protein database.
- Human Gene Mutation Database, OMIM database are clinical databases
- PubMed is a Bibliographic Database

Database Mining Tools (Analysis Tools)

Utilization of various databases requires the use of suitable search engines and analysis tools. These tools are called Database mining tools and the process of data utilization is known as database mining. Some Analysis Tools are BLAST, ENTREZ, DNAPLOT, LIGAND

Applications/Uses

Some of the major applications include in the following fields:

1. **Molecular medicine** - The completion of the human genome and the use of bioinformatic tools means that we can search for the genes directly associated with different diseases and begin to understand the molecular basis of these diseases more clearly. This new knowledge of the molecular mechanisms of

disease will enable better treatments, cures and even preventative tests to be developed.

2. **Personalised medicine-** Clinical medicine will become more personalised with the development of the field of pharmacogenomics. This is the study of how an individual's genetic inheritance affects the body's response to drugs.
3. **Preventative medicine-** With the specific details of the genetic mechanisms of diseases being unravelled, the development of diagnostic tests to measure a person's susceptibility to different diseases may become a distinct reality.
4. **Gene therapy-** Gene therapy is the approach used to treat, cure or even prevent disease by changing the expression of a person's genes.
5. **Drug development-** With an improved understanding of disease mechanisms and using computational tools to identify and validate new drug targets, more specific medicines that act on the cause, not merely the symptoms, of the disease can be developed.
6. **Climate change Studies-** To reduce atmospheric carbon dioxide levels, one may study the genomes of microbes that use carbon dioxide as their sole carbon source.

References & Further reading:

1. Noor F, Tahir ul Qamar M, Ashfaq UA, Albutti A, Alwashmi ASS, Aljasir MA. Network Pharmacology Approach for Medicinal Plants: Review and Assessment. Pharmaceuticals. 2022 May;15(5):572.
2. Zhang W. Network pharmacology: A further description. 2016; Network Pharmacology, 2016, 1(1): 1-14
3. Muhammad J, Khan A, Ali A, Fang L, Yanjing W, Xu Q, et al. Network Pharmacology: Exploring the Resources and Methodologies. CTMC. 2018 Sep 18;18(12):949–64.
4. Luscombe NM, Greenbaum D, Gerstein M. What is bioinformatics? An introduction and overview. Yearb Med Inform. 2001 Aug;10(01):83–100.
5. Wani MY, Ganie N, Rani S, Mehraj S, Malik F, Dar K. Advances and applications of Bioinformatics in various fields of life. International Journal of Fauna and Biological Studies 2018; 5(2): 03-10

Exercise on Network pharmacology

- Conduct the Identification (Data mining) active constituents by Pubmed, IMPPAT or PubChem in digital library.
- Conduct Target identification by Binding DB.
- Conduct Identification of disease gene by DisGeNET.

- Conduct GO (Gene ontology) enhancement analysis by KEGG Pathway, R ratio.
- Conduct Network construction by STRING, PPI network, sytoscope.

Multiple Choice Questions (MCQ)

1. A new discipline emerged which attempts to understand drug actions and interactions with multiple targets.

   a. Pharmacokinetics b. Pharmaco dynamics

   c. Network Pharmacology d. Clinical Pharmacology

   Ans: c. Network Pharmacology

2. The concept of network pharmacology was proposed by

   a. Hopkins b. Edwards c. Kingston d. Charles

   Ans: a. Hopkins

3. Netlogo is refered to

   a. Target- drug interactions b. Network construction

   c. Network visualization d. Identify drug candidates

   Ans: c. Network visualization

4. Drug Bank refers to

   a. Network construction b. Identify drug candidates

   c. Network visualization d. Target drug interactions

   Ans: b. Identify drug candidates

5. STRING- function protein association network

   a. Identifying drug candidates b. Network visualization

   c. Target drug interactions d. Network visualization

   Ans: d. Network visualization

6. MATADOR refers to

   a. Identifying drug candidates b. Network visualization

   c. Target drug interactions d. Network visualization

   Ans: c. Target Drug interactions

7. Conceptualizing biology in terms of molecules and applying "informatics techniques" to understand and organize the information associated with these molecules, on a large scale is called

   a. Biology b. Bioinformatics

   c. Biopharmacology d. Biopharmacy

   Ans: b. Bioinformatics

8. Tools and resources that aid in the analysis of data, programs such as FASTA and PSI-BLAST is related to

   a. Biology b. Biopharmacology

   c. Bioinformatics d. Biopharmacy

   Ans: c. Bioinformatics

9. The process of data utilization is known as

   a. Data plan b. Data Mining

   c. Statistics d. Research

   Ans: b. Data Mining

10. The approach used to treat, cure or even prevent disease by changing the expression of a person's genes is known as

    a. Gene therapy b. Preventive Medicine

    c. Molecular medicine d. Drug Development

    Ans: a. Gene Therapy

*****